

# Metals Review

THE NEWS DIGEST MAGAZINE

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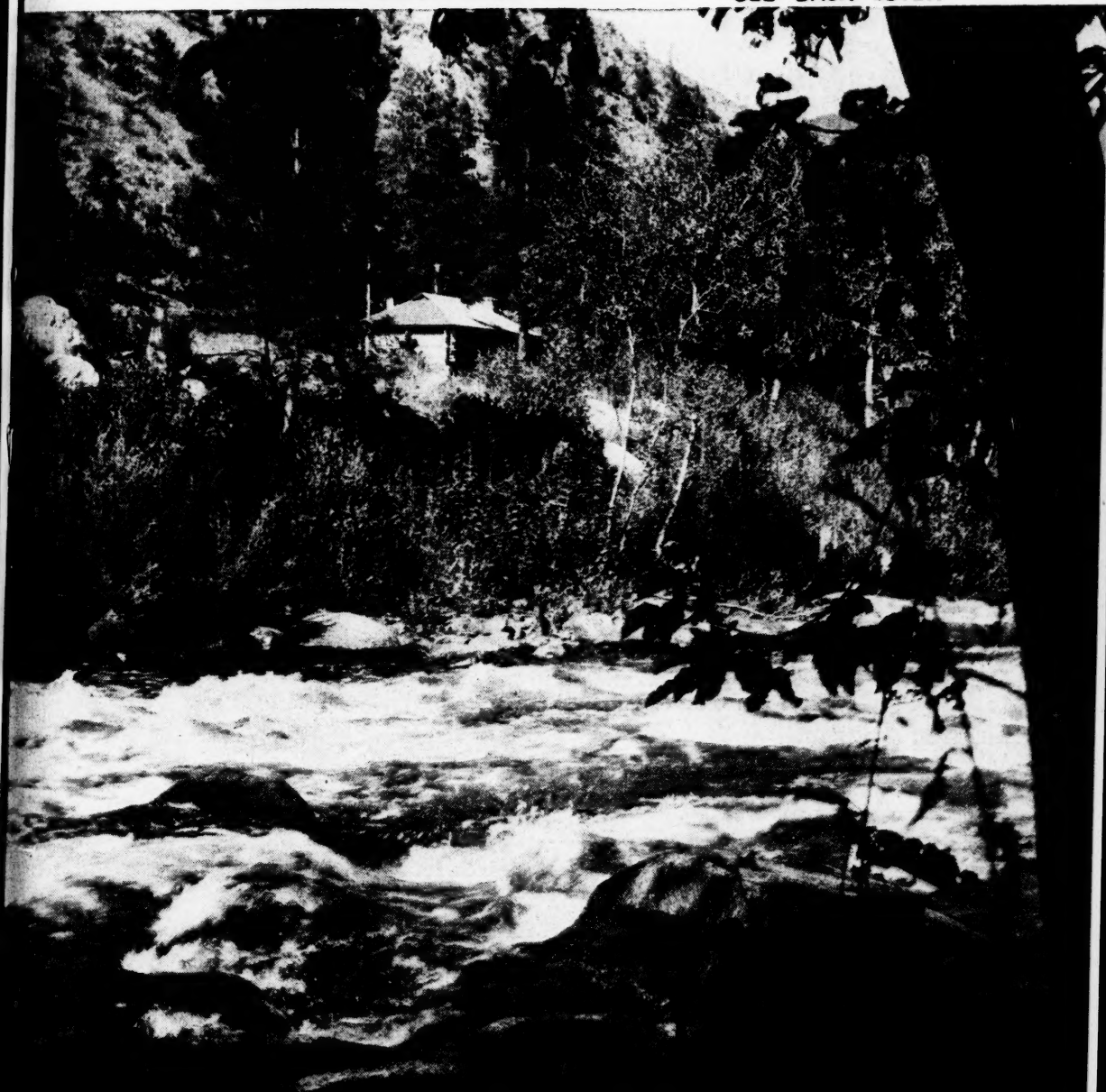
FEATURING: CORROSION W.C.C. RESEARCH

October, 1949

*You can eliminate Stream Pollution*

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# Metals Review

THE NEWS DIGEST MAGAZINE

RAY T. BAYLESS, Publishing Director

MARJORIE E. HYSLOP, Editor

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VOLUME XXII, No. 10

OCTOBER, 1949

## A.S.M. REVIEW OF METAL LITERATURE

ORE BENEFICIATION.....	13
Preparation and Concentration	
SMELTING, REDUCTION AND REFINING.....	14
(Including Electrolytic Refining)	
PROPERTIES.....	17
Physica, Mechanical and Chemical	
CONSTITUTION AND STRUCTURE.....	22
Metallography, Constitution Diagrams Crystal Structure	
POWDER METALLURGY.....	26
Processes and Products	
CORROSION.....	27
Theory, Measurement, Prevention (Except Coatings)	
CLEANING AND FINISHING.....	29
Chemical and Mechanical; All Types of Coatings Except Electrodeposited	
ELECTRODEPOSITION AND ELECTROFINISHING.....	31
(Plating Electropolishing, Electroforming)	
PHYSICAL AND MECHANICAL TESTING.....	32
(Including Stress Analysis)	
ANALYSIS.....	33
Qualitative and Quantitative; Identification Methods	
APPARATUS, INSTRUMENTS AND METHODS.....	35
Industrial Measurement and Control (Except Temperature); Laboratory Equipment and Procedures	
INSPECTION AND STANDARDIZATION.....	37
(Including Quality Control, Radiography, Specifications)	
TEMPERATURE MEASUREMENT AND CONTROL.....	38
FOUNDRY PRACTICE.....	38
Methods and Equipment (Except Furnaces)	
SCRAP AND BYPRODUCT UTILIZATION.....	40
FURNACES AND HEATING DEVICES.....	40
(Including Induction and Resistance Heating Equipment)	
REFRACTORIES AND FURNACE MATERIALS.....	42
HEAT TREATMENT.....	42
(Including Flame Hardening, Induction Heating, Cold Treatment)	
WORKING.....	44
Rolling, Drawing, Forging, Stamping and Presswork, Shot-Peening	
MACHINING.....	46
(Including Tools, Machinability and Cutting Fluids; Excluding Flame Cutting)	
MISCELLANEOUS FABRICATION.....	48
General Manufacturing and Assembly Procedure; Plant Operations; Materials Handling	
JOINING AND FLAME CUTTING.....	48
Welding, Brazing and Soldering	
APPLICATIONS.....	51
General and Specific Uses of Metals	
DESIGN.....	52
Metallurgical Factors in Design of Parts, Equipment and Structures	
MISCELLANEOUS.....	52
(Including Research, Lubrication and Friction; Other General and Unclassified Subjects)	

## SPECIAL FEATURES

Corrosion, by R. S. Peoples and F. W. Fink.....	4
----------------------------------------------------	---

*A survey of the year's literature points up the urgent need of conserving raw materials by protective and preventive measures*

Picking Right Metal for Parts Big Job of Metallurgists, by R. E. Van Deventer.....	8
------------------------------------------------------------------------------------------	---

*The important role played by the metallurgist in modern industry, as revealed by a reprint from a Detroit newspaper*

Important Lectures Reported... 9-11
-------------------------------------

*Television and Modern Engineering Progress (W. R. G. Baker); Basic Principles of Metal Spraying (Walter B. Meyer); Induction Forging (H. B. Osborn); and others*

## DEPARTMENTS

The Reviewing Stand.....	9
Thirty Years Ago.....	11
Meeting Calendars.....	11, 12
Employment Service Bureau....	53
Advertisers Index.....	55

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(3) OCTOBER, 1949

# Corrosion

By R. S. Peoples and F. W. Fink  
Battelle Memorial Institute

*A Survey of the Year's Literature  
Points up the Urgent Need of  
Conserving Raw Materials by  
Protective and Preventive Measures*

THE SUBJECT of corrosion increasingly impresses one with its scope and importance. There are many reasons for this beyond the fact that corrosion problems affect all consumers of metals and, therefore, enter as an economic factor in the affairs of a country and its industries. As everyone is aware, the recent war made great inroads into our ore reserves. This will undoubtedly affect the quantity of common metals which we can expect in the future on a familiar price scale. A dwindling in supply and availability of metals certainly suggests the urgent need for their conservation. The war, in addition, created many new and unusual corrosion problems associated with the production of plutonium. It showed rather definitely that the difference between equipment functioning properly in this country and not functioning at all in the tropics can be attributed to a difference in corrosion rates.

Corrosion of equipment in the chemical industry has increased in recent years because of the higher temperatures and pressures involved. In many instances, the practicability of a chemical process is directly related to the amount of corrosion associated with the process. Likewise, the power equipment industry is faced with current or impending corrosion problems caused by higher steam pressure and the hot gases employed in the gas turbine.

The above examples are only a few of the reasons why the subject of corrosion has grown in importance. Many others could be cited. It is no wonder then that the literature is extensive and scattered through a great many journals. Even that reported during the year is extremely difficult to review and report in a single article. One can say that the majority of the recent published reports deal, in general, with effective means of combatting a specific corrosion problem. Considerably fewer papers deal with the mechanism whereby corrosion attack takes place or can be predicted.

No attempt will be made in the following discussion to review all the papers which have been published in the past year on corrosion. Only those which deal, for the most part, with corrosion control methods and which emphasize some of the important highlights in the corrosion field will be annotated.

METALS REVIEW (4)

## Cathodic Protection

Cathodic protection is possibly the one method known for preventing or virtually eliminating corrosion. This method is widely used to protect many miles of buried iron pipe and power distribution lines, and is now receiving greater attention in the protection of hot and cold water tanks, superheaters, heat exchangers, and on certain marine equipment such as rudders and ship plating. The principle of its application, in simple terms, involves neutralization of the electric currents that operate between the many anodes and cathodes of the metal surface.

One method of cathodic protection is to use an external anode connected to the positive terminal of a rectifier, or other source of d.c. current, with the structure to be protected connected to the negative terminal. Another method is to use sacrificial anodes of zinc, aluminum or magnesium, which set up the necessary current protective to iron without an external power source. Such anodes are naturally dissolved by the current they discharge and must be renewed at intervals.

Several factors influence the selection of metals as galvanic anodes (6B-117, Sept. 1949). Among these

metal. Additional voltage impressed provides increased "throwing power", reduces the number of installations required, and correspondingly reduces installation costs.

The following table gives the electrochemical equivalents of three commonly used anodic materials:

METAL	G. PER AMP-HR.	LB. PER AMP-HR.	AMP-HR. PER LB.
Zinc	1.22	23.5	372
Magnesium	0.45	8.8	1000
Aluminum	0.33	6.5	1352

These theoretical current yields are seldom realized in actual practice because of side reactions. Thus, current efficiency and the effect of operational and environmental factors must be determined.

As a general rule, the most desirable anodic materials exhibit a minimum of polarization with respect to time and current density.

Magnesium, because of its high anodic position in the emf. series, is admirably suited as an anodic material. Commercially pure magnesium has a solution potential 0.1 volt higher than its commonly used alloys. However, it is more subject to lower current efficiencies, with a correspondingly shorter life. While some of the voltage is sacrificed in alloying, this loss is more than compensated by increased efficiency and prolonged anode life. A special magnesium alloy of high current efficiency has been developed for anode use. The composition limits are 5.6 to 6.7% Al, 0.8% Mn, 2.5 to 3.5% Zn, 0.3% Si, 0.05% Cu, 0.003% Ni, 0.003% Fe, 0.3% other impurities, and the balance magnesium.

Aluminum is a good anodic material for cathodic protection. However, where an external source of d.c. power is applied, anodes of aluminum-copper alloys such as 17S-T and 24S-T are superior to either commercially pure aluminum or aluminum-zinc alloys. One of the inherent advantages of these aluminum-copper alloys is their low electrochemical equivalent. With 100% anode current efficiency, a smaller weight of aluminum will be dissolved per amp-hr. than for any other appropriate metal.

High-purity zinc is also used for cathodic protection, but here the re-

Literature references are cited by the corresponding item number in the Review of Current Metal Literature instead of repeating the entire title, author, and source. This information can be obtained by referring to *Metals Review* for the month indicated in 1949, or the 1948 bound volume of the A.S.M. Review of Metal Literature (Volume 5).

are: (a) the potential of the anode material with respect to the metal to be protected; (b) the electrochemical equivalent of the anode metal; (c) the polarization characteristics of the anode metal as affected by time, environment, and anode current density; and (d) the uniformity of the anode metal composition.

The metal selected must not only be anodic to the metal to be protected, but the potential difference developed must be sufficient to polarize properly the local cathodes of the protected



**Robert S. Peoples (left)** assists in the supervision of research in corrosion technology and physical chemistry at Battelle Institute. He is a graduate of Ohio State, and has been on the Battelle staff since 1934. He is co-inventor of a free-machining stainless steel.



**Frederick W. Fink (right)** is engaged in research in electrochemistry and corrosion technology, and has been at Battelle since 1938. He holds an electrical engineering degree from Cornell, and M.S. from Cambridge University.

sistance of the electrolyte assumes greater importance since a highly resistant electrolyte will inhibit the galvanic deterioration of the zinc. Where this resistance may amount to several thousand ohms per cc., zinc is not economical because such a large area of zinc would be required for satisfactory results.

In a series of three articles on cathodic protection (6B-19, Feb. 1949; 6B-35, March 1949; 6B-43, April 1949), the current literature is reviewed as well as the theory governing the causes and inhibition of attack on steelwork, principally by soils and soil environments. Particular emphasis is placed on modern application of the magnesium anode to safeguard pipelines and its relative merits with respect to aluminum. The problem of backfills for both materials is considered in detail. Actually, the precise composition of a backfill is not of great importance for magnesium anodes. Provided that the soil environment be moist, neutral or alkaline, and free from chlorides, no backfill is necessary. When in doubt, bentonite with calcium sulphate and magnesium hydroxide is recommended.

The tendency of aluminum to form a protective oxide film in the atmosphere and in many aqueous solutions is well known. The film is adherent and is a good insulator; it is thus clear that, for an aluminum anode to function satisfactorily, it is essential to minimize the formation of such a film. Aluminum anodes buried in most soils will form such a film, and use of the correct backfill is, therefore, of particular importance. In investigations on various backfills for aluminum, it was found that the presence of lime and sodium chloride is beneficial.

Rectifiers can be used for cathodic protection, and their advantages and disadvantages over the use of galvanic anodes are discussed by A. L. Stegner (6B-107, Aug. 1949).

When aluminum and magnesium anodes are used for cathodic protection of hot and cold water tanks (both domestic and industrial), and similar steel structures (6B-113, Aug. 1949; 6B-35, March 1949), the degree of corrosion control achieved is affected by many factors. Among these are: (a) rate of water change or flow, (b) amount and nature of dissolved solids, (c) concentration of dissolved gases, (d) current flow from the

anode as determined by the electrical conductivity of the water, and (e) water temperature.

The protection afforded by magnesium anodes in water tanks is largely confined to the tank alone. The protective current is not sufficient to penetrate far into the piping that conveys water to and from the tank. The anode is usually installed in as nearly a central location in the tank as possible so as to obtain equitable distribution of current.

Aluminum has certain advantages in this type of application. Its corrosion products are white or colorless and adhere to the anodes after forming. This prevents discoloration or contamination of the water. The lightness of aluminum anodes also makes for lower cost of the installation.

### Resistant Metals or Alloys

Alloying—including surface impregnation—is one of the effective means by which the physical, chemical, and corrosion behavior of metals can be improved. Surface coatings of silicon-iron alloy produced by reaction of  $\text{SiCl}_4$  with iron are effective in reducing galling of rubbing surfaces, as well as considerably improving the resistance of iron to many mineral acids. The surface alloy so produced is similar to the commercial 14% silicon-iron alloys used as corrosion resistant castings for equipment in the chemical industry.

The stainless steels are among the most popular of the corrosion resistant alloys. They are iron-base alloys containing 12 to 18% Cr and often one or more additional elements such as Ni, Mn, Cu, Mo, Ti, Se, or Co. They derive their corrosion resistance by virtue of a property called passivity. Such steels are outstandingly resistant to dilute or concentrated nitric acid and to many other media, and are corroded appreciably only by reagents such as chlorides that break down their passivity.

Two recent symposiums cover constructional materials for fatty acids (6A-53, June 1949; 6B-84, July 1949) and for hydrochloric acid (6A-2, Feb. 1949; 6A-17, March 1949; 6A-34, April 1949). Metals recommended for hydrochloric acid service, with rather definite limits of application, include high-silicon irons, nickel, tantalum, silver, and such special alloys as Chlorimet-2, Worthite, Durimet-20, monel, Hastelloy-B, and Hastelloy-C.

For fatty acids, stainless steels, nickel, nickel-base alloys, and aluminum are recommended.

Equipment and constructional materials for 17 important chemicals are listed in the 13th Chemical and Metallurgical Report (6A-142, 1948). Flow sheets show in a concise manner the process for the production of each chemical; the recommended materials of construction of each piece of equipment are identified. A few of the important chemicals listed are acetic acid, ammonia, cane sugar, chlorine and caustics, fatty acids, hydrofluoric, nitric and phosphoric acids, hydrogen peroxide.

An extensive tabular compilation of data on metallic and nonmetallic materials emphasizes resistance to corrosion by various atmospheres and chemicals (3A-124, 1948). Mechanical, electrical, thermal, optical, and other properties are given as well as manufacturing information.

A useful summary by Norman S. Mott (6A-60, June 1949) covers the corrosion resistance of stainless steels (various types), monel, and nickel castings to alkalis and salts and to various common acids over a range of compositions and temperatures.

Titanium is expected to have wide application because of its corrosion resistance. In a symposium sponsored by the Office of Naval Research extensive data on the chemical and physical properties of titanium are given (25D-5, April 1949; 3C-55 through 62, May 1949; 25C-56, Oct. 1949). Laboratory tests indicate that titanium is resistant to nitric acid in all concentrations up to 95% at 25° C. and 65% at 55° C. to boiling; relatively dilute warm hydrochloric and sulphuric acids; aqua regia at 30° C.; water saturated with chlorine at 80° C.; bleach solution at 30° C.; ferric chloride (boiling 10%); boiling 28% calcium chloride; and boiling 10% sodium hydroxide. Titanium is in the same class as platinum and Hastelloy-C in its resistance to attack by marine conditions.

If this metal can be produced at a reasonable cost, it will supplant steel, stainless steel, the light metals, and other materials in many instances. In corrosion applications, however, care should be exercised in its use. Statements comparing titanium with the stainless steels, Hastelloy-C, and platinum are likely to lead the uninitiated into pitfalls. A conservative policy in the application of titanium should be observed and each corrosion problem carefully studied.

### Inhibition and Passivation

Since steel is still the most important metal from the standpoint of use and production, it is only natural that considerable attention be given to protecting it from corrosive attack. A convenient but temporary method of preventing the formation of rust on steel is to apply an inhibited coating of oil—a widely accepted practice

(5) OCTOBER, 1949

for protection of steel against moisture in storage and shipment. Baker and Fisman (6A-148, 1948) have studied and determined the usefulness of some 75 polar-type additives for oil systems.

Adsorption on the metal surface can be explained—depending on the combination of polar inhibitor and metal involved—by (a) the hydrogen of the acid or the nitrogen of the ammine coordinating with the electrons in the metal surface, (b) electrostatic interaction between the molecular dipoles involved and the metal surface, and (c) chemical reaction with active metals to form, for example, a salt or ammonium compound.

To be effective, a polar rust inhibitor must be both amphipathic and oil soluble. The polar group must be attached to the steel. Rust inhibition also depends on the lifetime of the adsorbed film, the permeability of the film to water, and ability of the reaction products found at the metal-film interface to diffuse through the film.

Failure of protection may be caused by thermal agitation at increased temperature. Abrasion or wear may cause failure as well as the leaching action of water.

Hackerman and Schmidt (6B-93, July 1949) discuss the role played by adsorption of organic inhibitor films from solution in preventing corrosion. Such films are known to resemble crystals in behavior. Electron diffraction studies revealed three degrees of firmness of adsorption of organic films: (a) substances which are volatilized completely from the metal surface due to the action of the electron beams, (b) substances which can be desorbed in a particular solvent, and (c) substances which are firmly bonded to the metal and should function as effective inhibitors. The authors ascribe the prevention of corrosion to the blanketing action, or to the increase in hydrogen overvoltage caused by the adsorption of organic molecules at cathode areas.

Physically adsorbed substances make it more difficult for corrosion ions in the solution to reach the metal. Chemisorbed organic molecules go further in restraining the metal atom from leaving the metal surface. Even with incomplete adsorption of the inhibitor, nonpolar molecules can be incorporated in the film, thus providing coverage.

Cardwell and Eilers (6b-124, 1948) find that wetting agents improve the efficiency of thiourea and nitrogen-ring corrosion inhibitors in hydrochloric acid. The attack of the acid on the steel is reduced to an extent that depends on the degree of wetting in the original solution. If it is low, the wetting agent improves the inhibitor performance. A partial explanation lies in the smaller size of the hydrogen bubbles evolved, and this, in turn, causes a decrease in pitting (6b-125 and 6b-126, 1948).

W. H. J. Vernon (6A-29, April 1949) tells of British experience with so-

dium benzoate to impregnate papers for wrapping steel parts to be sent to moist, humid atmospheres. The use and effectiveness of so-called "vapor phase" inhibitors have been reported (6A-46, May 1949; 6B-42, April 1949). Sodium benzoate, according to Vernon, when used as an anti-freeze in liquid-cooled engines, also inhibits corrosion.

The inhibitor is the most important agent to be selected in the acid cleaning of scaled boilers, pipelines, and heat exchangers. Alquist (6B-33, March 1949) gives the composition of 143 scales and the method of removing them by inhibited hydrochloric acid. Constituents of the scales are calcium and magnesium carbonates and sulphates, iron oxides, and, in some areas, magnesium silicates.

Pickling inhibitors are evaluated from the standpoint of hydrogen embrittlement by Zapffe and Haslem (6B-5, Feb. 1949). Their results showed that, under cathodic pickling conditions, the variable of metal attack was eliminated, the production of hydrogen on the metal surface was controlled, and any polar or ionic constituent of the inhibitor came under the influence of an electric field. Numerous reagents were tested.

Bockris and Conway have measured the overvoltage on iron electrodes in N 10 hydrochloric acid (6B-81, June 1949). Well-known organic inhibitors increase the overpotential, whereas activators decrease the overvoltage. The magnitude of the increase in hydrogen overvoltage at high current densities becomes greater with concentration and complexity of the inhibitors. The authors feel that the mechanism of inhibition is not associated with mechanical protection of an adsorbed film. Hoar (6B-45, April 1949) finds that organic inhibitors interfere with both the cathodic and anodic processes. His results indicate that the adsorption is general and not specifically cathodic. The polar film is not complete and tends to shift continuously.

G. T. Colgate presents a comprehensive review of the use and effectiveness of inhibitors for controlling metal corrosion under a variety of conditions (6A-153, Jan. 1949; 6A-19, March 1949; 6B-61, May 1949).

Mears has proposed a unified mechanism of passivity and inhibition based on the behavior of local elements in metal surfaces (6A-15, March 1949). For each type of passivity, the effect on the open-circuit potential and the polarization of the anodic and cathodic areas is discussed, as well as on the potential drop caused by the resistance between anode and cathode areas. Passivity may be achieved by (a) reduction of the open-circuit potential difference between local anodes and cathodes, (b) increased anodic polarization, (c) increased cathodic polarization, or (d) a combination of these factors.

From the thermodynamic standpoint, a metal cannot corrode unless

it is unstable with relation to its corrosion products (6A-51, May 1949). This can be predicted if the free energies or the chemical potential is known. By plotting the equilibrium potential of each corrosion reaction against the pH of the solution, a picture specific for each metal and environment can be obtained. Such diagrams are available for iron and copper in solutions with and without oxidizing agents.

## Protective Coatings

One common way to reduce or to eliminate the attack on metal is to isolate it from the corrosive media by some physical barrier such as an organic, metallic, or ceramic coating.

In the field of organic coatings, five of the outstanding materials available to the paint chemist in designing finishes of extreme corrosion resistance are: (a) phenolic resins (both oil soluble and thermosetting); (b) vinyl resins; (c) chlorinated rubber; (d) Courmarone-Indene resins; and (e) specialty resins (synthetic rubber derivatives) (7A-254, 1948). The 100% phenolic resins have excellent durability and resistance to moisture and abrasion. Their chemical properties are excellent when compared to the old type of ester gum and fossil resin varnishes, but not so good as the chemical resistance of vinyl resins and chlorinated rubber.

The Courmarone-Indene type of resin (manufactured as a byproduct of bituminous coal coking) is chemically inert and has good resistance to acids, alkalis, and other highly corrosive chemicals. In respect to corrosion resistance, these resins excel as aluminum vehicles.

Vinyls have high acid resistance, are not attacked by alkali, resist greases, oils, and aliphatic solvents, and can be used under water for long periods of time. A disadvantage is their high-solvency solvents which often tend to swell and lift old paint coats in repaint work.

Chlorinated rubber is now being used extensively wherever resistance to corrosive chemicals, highly corrosive atmospheres, fresh water, and salt water is required.

Many other good papers have been published during the past 12 months covering the formulation, use, corrosion resistance, and physical properties of organic coatings (7A-244, 1948; 7A-58, June 1949; 7A-23, March 1949; 6B-46, April 1949; 7A-38, April 1949; 7A-57, June 1949).

Some 34 kinds of paint systems were evaluated for enclosed structural members in steel housing construction (7B-110, July 1949) under one or more of the following tests: (a) continuous immersion in water, (b) contact with air at high humidity, (c) continuous condensation, (d) alternate wet-dry conditions, and (e) continuous contact with insulation in the presence of water. The systems which seemed to afford maximum protection to most of the above conditions were

those in which the pigment was essentially 100% red lead.

An analysis of the year's literature failed to disclose any essentially new developments in the field of metallic coatings with respect to unusual corrosion resistance. This seems to be particularly true for hot-dip coatings

and for electroplated materials.

In closing, it should be pointed out that the series of papers presented at the Pittsburgh International Conference on Surface Reactions contain information of interest to the corrosion student or corrosion engineer. Twenty-eight papers were presented

at this conference and are now available in book form (6A-45, April 1949). The majority deal with surface reactions on metals—both theory and practice; surface catalysis, adsorption and desorption; theory of film optics; and application of the electron microscope in corrosion studies.

# Combat corrosion

WITH THIS HELPFUL BOOK—

## CORROSION OF METALS

Here is an excellent book on the many problems of corrosion. Many clues are given to the solution of the varied difficulties that arise in the use of metals. Based on a successful educational course, the book deals with the principles of metal corrosion and with problems encountered in steels, nickel-base alloys, copper-base alloys, and light alloys. Each contributor is well qualified . . . resulting in an exceptionally well balanced book covering a wide range of theoretical and practical subject matter.

Corrosion is considered from the standpoint of electrochemical attack with a general discussion of electrolyte, corrosion products, solution flow, bi-metallic couples, and metallurgical factors. Atmospheric corrosion of steel is discussed with respect to type of atmosphere, surface protection, and influence of small alloy additions; copper, phosphorus, silicon and chromium combinations are discussed in detail. Fresh water, sea water and soil corrosion come into this picture.

Corrosion of stainless steels and nickel-base alloys is considered with reference to composition, heat treatment, surface conditions, and environment. Summary of the data available is tabulated. Influence of minor elements in the analysis on acid corrosion is considered in detail, along with heat resistance and stress-corrosion characteristics.

Comprehensive review of corrosion resistance of copper and copper-base alloys is presented with tables indicating environments that will and will not give satisfactory service life. Types of corrosion that are illustrated include general corrosion, pitting, erosion-corrosion, dezincification, stress-corrosion, intercrystalline cracking and corrosion-fatigue.

The problem of light metal corrosion is analyzed carefully, and the methods for evaluating this corrosion, by means of laboratory and exposure tests, are considered. Corrosion characteristics of the present commercial alloy systems are summarized. Corrosion resistance of clad aluminum alloys is illustrated by electropotential measurements and atmospheric exposure tests. Stress-corrosion and alloy protection by cladding and surface treatment round out the discussion.

192 pages . . . 70 illustrations . . . 6 x 9 . . . red cloth binding . . . \$3.00

*Technical Books of*

**AMERICAN SOCIETY FOR METALS**

7301 EUCLID AVENUE

CLEVELAND 3, OHIO

(7) OCTOBER, 1949

# Picking Right Metal For Parts Big Job Of Metallurgists

By R. E. Van Deventer

Chief Metallurgist  
Packard Motor Car Co.

Just before Si Freeman [automobile editor of the *Detroit Times*] sped away on vacation, he said: "Write all about metallurgy for me—in 600 words that people can understand!"

He disappeared before I could reply. So I had no choice—and neither do you readers.

Scores of books, each containing thousands of words, have been written on metallurgy.



R. E. Van Deventer

Now I'm supposed to do the job in 600 words! But metallurgists always are being asked to do the impossible.

Metallurgy is centuries old, but never has ceased to grow. For example, the American Society for Metals, our professional organization, had 10,000 members 10 years ago, including 725 in Detroit. Today, there are more than 22,000 nationally, with over 1400 right here in the world's automobile capital.

## Select Right Materials

Metallurgists used to be called "glorified blacksmiths", among other things. But we've grown in prestige, as well as in numbers, because proper metallurgy contributes to high quality, and high quality contributes to the success of a product.

Webster defines metallurgy as "the science and art of extracting metals from their ores, refining them and preparing them for use". Actually, we metallurgists in the automobile industry go beyond the Webster definition. And some of us also work with other materials—such as rubber, plastics and fabrics.

Our job is to select the right materials for all the thousands of parts in a car. But we don't stop there. We follow through right up the final assembly line, and keep on following through until the cars are years old—to make sure the materials were right and were processed right.

## 45 Kinds of Steel

Selection of materials is frankly complex. But I'm going to keep it simple and tell you only that, for example, there are at least 45 different kinds of steel in a Packard, each selected for a specific reason.

The manufacture of each Packard

METALS REVIEW (8)

*The column alongside is printed from the Detroit Times as an excellent representation of the importance of the metallurgist in industry. It was contributed by Mr. Van Deventer as one of a number of guest writers substituting for the Times automobile editor while he was on vacation.*

requires 3350 lb. of different carbon steels, 185 lb. of various alloy steels, 10 lb. of stainless steel, 752 lb. of cast iron, 55 lb. of malleable iron, 48 lb. of zinc alloys, 59 lb. of copper and copper alloys, 11 lb. of aluminum alloys, 30 lb. of lead, over 3 lb. of tin and more than a pound of antimony. And there are numerous other materials, all of which concern us metallurgists.

Some of our work involves "trouble-shooting", of course. But we spend most of our time trying to prevent trouble, improve materials and develop new techniques.

## Work as Team

In selecting materials, we first consider the job to be done by the part. We study the machinery available in our factory to find whether the material will be the most economical, yet practical, that we can uncover. Then we establish controls to insure that the material is made to specifications and processed to standards.

We devote major attention to the parts that undergo the most strain, such as gears, axles, steering and suspension mechanisms and engine components. But if the material isn't right, even a minor part can become a major problem.

We work as a member of the manufacturing-engineering team. We're associated closely with the engineers, yet come into daily contact with nearly everyone in manufacturing. We have to be well informed about other fields, and we have to be diplomats, as well as scientists.

## Add to Car's Safety

Metallurgy got a foothold in the auto industry through heat treating techniques, which made parts stronger and longer lasting. (Packard was a pioneer in this field, by the way.) Then management began to call on us metallurgists for more and more research, as the practical benefits of technical controls became increasingly evident. Today we're always way behind in our work, because the possibility of improvement always exists and new materials are constantly being developed.

We take pride in the fact that

metallurgy has doubled, tripled or quadrupled the life of many parts, thus contributing much to the serviceability and safety of automobiles. Metallurgy's contributions have benefited everyone—from the man on the final assembly line to the man behind the wheel.

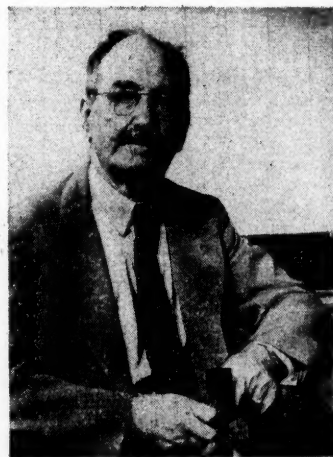
The trend in metallurgy is toward smaller, lighter, stronger and more efficient parts. We're everlastingly trying to get more out of our present materials and discover new and better ones.

## Win More Recognition

Most of us metallurgists are clothed in anonymity, which we don't mind because of the many satisfactions our work provides. But, in recent years, metallurgists have gained broader recognition inside and outside their plants. For example, my predecessor at Packard, W. H. Graves, who started out as a chemist, now is our vice-president and director of engineering.

I've just taken inventory of what I've said so far. Instead of telling "all about metallurgy", as requested, I find I'm just getting started.

## Wilbur B. Driver



Wilbur B. Driver, Aged 75, Founder and Board Chairman of the Wilbur B. Driver Co. of Newark, N. J., and Founder and Former President of the Driver-Harris Co., Died in September After a Three-Week Illness

## New Openhearth Plant

Immediate construction of a new \$12,000,000 steelmaking plant which can produce 400,000 tons of steel ingots per year has been authorized by the board of directors of Armco Steel Corp. The new plant will consist of three 225-ton openhearth furnaces of the latest design, housed in a building 20 x 700 ft. in dimensions.

## Rome Hears Talk On Television

Reported by R. Carson Dalzell  
Chief Technical Advisor  
Revere Copper and Brass, Inc.

The sciences of electronics and nucleonics are opening vast new fields of value to humanity, W. R. G. Baker, vice-president of General Electric Co., told the Rome (N. Y.) Chapter at its annual meeting in May.

Dr. Baker presented a lucid explanation of the fundamentals of nuclear structures to introduce his talk on "Television and Modern Engineering Progress". Even the most non-technical man in the audience was able to understand and follow the ideas he then outlined.

Using only the three fundamental particles—electrons, protons and neutrons—he showed how the two sciences in cooperation are developing a wealth of applications of great practical value.

Both the speaker and the program for the chapter's annual meeting were planned to be of particular interest

to the sustaining members. Approximately 60 attended the dinner, including executives of all the sustaining member firms. The representatives expressed approval of the educational courses and the founding of the student branch of the chapter. This branch, at the N. Y. State Institute of Applied Arts and Sciences in New Hartford, was made possible by sustaining membership fees.

The Rome Rotary Club on the same day honored the American Society for Metals as a contributor to community progress in Rome. The Rome Chapter cooperated with the Rotary Club in arranging for Dr. Baker to address the latter at noon on "The Business Aspects of Television".

### Kaiser Changes Name

Kaiser Co., Inc., the West's largest independent steel producer, has taken the name of Kaiser Steel Corp. in order to identify its type of business more readily. Since ground was broken for the Kaiser steel plant at Fontana, Calif., in 1932, the plant has grown steadily to the point where it has a capacity of a million tons of ingots annually.

## Color Photography Shows Expanding Industrial Use

Reported by E. R. Freeman  
Permanente Metals Corp.

Color photography from its technical aspects and applications, to all of its art and beauty, was spread before the eyes of a mixed group at the June meeting of the Inland Empire Chapter A.S.M. Cooperating in the meeting were the local chapters of American Welding Society, Inland Empire Chemists, and the Permanente Camera Club.

Victor Hicks, physicist in the X-Ray Division of Anasco, chose as his subject "Subtractive Color Photography, or How Anasco Color Film Works". Dr. Hicks not only took the audience through the color film process step by step, but also drew many ohs and ahs by illustrating his points with beautiful color slides of scenic spots.

"Color as of today is only on the threshold of what it can do. In medicine, in science, in industry, in our homes, color is rapidly finding application in fields long pioneered in black-and-white photography," Dr. Hicks concluded.

## The Reviewing Stand

OUT OF AN A.S.M. old-timer's attic comes a long-forgotten album, well worthy of addition to A.S.M. memorabilia. Bound in a heavy tooled cover tied with green silk cord, it is titled "A Reprint of the Steel Treating Exposition Section of the *Iron Age*, Sept. 11, 1924". Twenty-five years ago, according to this old-timer's recollection, this reprint served the purpose of the "Official Program" now distributed to those attending the annual Metal Show.

Turning the cover, we find the first inside page devoted to an editorial-headed "Keeping Step With Progress". Because a slight change in a couple of figures would make this editorial just as timely as five-centers, it seems worthy of reprinting in full:

"If you want to make money," they say, 'go where money is.'

"The same way with progress.

"That is why so many endorse the American Society for Steel Treating.

"It represents a splendid accomplishment in scientific, friendly cooperation for the advancement of the metalworking industry. Accordingly, it now has over 3500 members, of whom more than 65%, together with fifty thousand others, attended the Pittsburgh meeting last year. This growth, occurring within the short space of six years, shows an unparalleled development.

"The progressives of the industry will be at this Convention and Exposition at Boston, Sept. 22 to 26, as they were at the last and those before, because they find ideas, suggestions and inspiration in the formal sessions as well as in the exposition of equipment and materials.

"The Society invites you to make fullest use of the discussions, meetings and exhibits at the convention. It hopes also that you will be able to take advantage of the opportunities afforded for seeing industrial as well as historic Boston."

The remainder of the book—well larded with full-page advertisements handsomely printed on heavy buff-colored paper—consists of the list of exhibitors and floor plan, together with a brief preview of the program. Again we quote:

"The youngest American technical society—the American Society for Steel Treating—born only five years ago in Chicago, celebrates its sixth anniversary this year in Boston. Its expansion to a leading position in the technical world in so short a time has been remarkable.

"As usual, a technical program of sterling merit . . . has been prepared. . . . Probably the largest exposition of the kind ever held is located at the Commonwealth Pier. Over 165 exhibitors, covering a larger space than any previous affair, occupy this unique location." [Footnote: Exhibitors as of 1949 number some 350—far too many to be accommodated now at Boston's Commonwealth Pier, or, in fact, in any but a half dozen exhibit halls in the country's largest industrial cities.]

### Wanted—Rolling Mill

From time to time we get requests for sources of unusual or hard-to-locate types of equipment, and an appeal to our readers has brought the desired results pronto. The reason is aptly phrased in our latest letter of inquiry: "In view of the excellent caliber and wide circulation among metal processing personnel of *Metals Review*, we are hoping you will see fit to include an item for us in a near-future issue."

This reader wants to locate a small rolling mill for use in fundamental research in the rolling of metals—research to be done on a *pro bono publico* basis. *Metals Review* will be glad to forward to him any information that might further the cause.

M.R.H.

## Explains Metal Spraying Principles



Walter B. Meyer (Center) Described Metal Spraying Methods and Applications Before the St. Louis Chapter A.S.M. Left is Lou Malpoker, chairman, and at right is Ed St. Eve, past chairman of the St. Louis Chapter

Reported by H. O. Nordquist  
Manager, Alloy & Stainless Steel Dept.  
Joseph T. Ryerson & Son, Inc.

A metal sprayed coating is made of thin flake-like particles that form a laminar structure, Walter B. Meyer explained before a recent meeting of the St. Louis Chapter A.S.M. Mr. Meyer, manager of the Metallizing Division of the John Nooter Boiler Works Co., of St. Louis, and one of the pioneers in the metallizing industry, spoke on the "Basic Principles of Metal Spraying".

During the time that these molten particles are in flight from the nozzle of the gun to the work, he continued, a thin film of oxide is formed on the molten globule of metal. When the particles strike, they flatten out, rupture the oxide film, and their surface area is greatly increased. It is well known that some metals and their oxides adhere tenaciously to each other. Therefore, there is reason to believe that the cohesion between the particles of sprayed metal is largely due to the adhesion of the molten particle to its oxide film, and to the oxide envelope of one particle cohering to the oxide envelope of the next particle. These oxides play a major part in the structure and strength of such coatings, and also affect the physical and chemical properties.

The metal spraying process has long been used to coat large areas with aluminum and zinc for protection against various forms of industrial corrosion. Zinc metallized coatings are resistant to the usual corrosive media in direct proportion to the weight of the zinc applied, and to no other factor. Porosity of such coatings is of little importance because zinc is almost invariably anodic to iron and will corrode away in preference to the base material.

Zinc spraying is used for coating of tuna clippers on the Pacific Coast, coal barges on the Ohio River, vapor degreasing units, and structural steel members exposed to the oxidizing

action of industrial atmospheres.

Aluminum also is usually anodic to steel under most conditions. Here, again, the porosity of the sprayed metal coating is of little concern because the products of corrosion tend to clog the pores.

Stainless steels, monel, nickel, and some of the Hastelloy alloys are used to coat machine parts, as well as for the repair of worn items.

Probably the most important single phase in the entire metallizing procedure is the preliminary preparation. There are five basic methods; each type of preparation has its place and the method to be used is dictated

### Undergraduate Award and Scholarship Competition

The third annual competition of the Engineering Undergraduate Award and Scholarship Program has been announced by the James F. Lincoln Arc Welding Foundation.

This program offers annually \$6750 in awards and scholarship funds to engineering undergraduate students and to schools for the best papers prepared by undergraduates on arc welded design, research, fabrication or maintenance. A total of 77 awards ranging from \$1000 to \$25 will be awarded to students and \$1750 for seven scholarships will be awarded to schools.

A copy of the rules and conditions may be obtained by writing James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

### P. A. E. Armstrong Dies

P. A. E. Armstrong, 66, internationally known metallurgist and a pioneer in the development of stainless steel, died on Aug. 8 in Westport, Conn. In 1914, at the Ludlum Steel Co., Watervliet, N. Y. (now Allegheny Ludlum Steel Corp.), he first discovered the silicon-chromium valve steels used successfully for resistance to high-temperature gases.

by the requirements of the job. Unless facilities for all of these methods are available, the temptation to substitute one less effective, but more convenient, will often arise.

The metal spraying process is no stranger to the field of production applications. They range from the metallizing of carbon resistors (to facilitate soldering operations) to the coating of aircraft cylinder barrels with aluminum.

### Fighter Planes Seen in Tour of Aircraft Plant

Reported by Arthur C. Willis  
Instructor  
Southern Methodist University

In lieu of a technical meeting the North Texas Chapter A.S.M. arranged for a tour of the Chance Vought Aircraft plant at Grand Prairie on Sept. 7. Present for this tour were 26 members and 107 guests.

The meeting was opened by a welcoming address from Chapter Chairman N. H. Simpson, in which he set forth the aims of the Society. B. J. Anthony, Chance Vought public relations representative, then gave a short history of the company. He outlined the background and details of the unprecedented move to Texas, in which the entire plant, including machinery, materials, subassemblies, and a nucleus of approximately 1600 employees (with their families) were transported to the inland location in a little more than a year.

The visitors were permitted to examine at close range the Corsair (piston-engine fighter) and the Pirate (jet-engine fighter), now in production, and to view from a respectful distance a partly completed Cutlass (new twin-jet fighter).

### Kerst to Manage New Office for Houghton

Appointment of Orum R. Kerst as sales manager, eastern division, north, has been announced by E. F. Houghton & Co., Philadelphia.



O. R. Kerst

The newly created division covers the activities of the 14 men in New York and the New England states. The division office will be in Worcester.

Mr. Kerst has been a sales and service engineer for E. F. Houghton & Co. in the Worcester area since 1940. Prior to then he was engaged in research and development for Houghton, and from 1934 to 1938 was a metallurgist for the American Steel & Wire Co.

He is currently chairman of the Worcester Chapter A.S.M.

## IMPORTANT MEETINGS For November

**Nov. 1—Society for Applied Spectroscopy Meeting, Socony-Vacuum Training Center, 63 Park Row, New York City.** (Roger W. Loofbourov, chemical control division, Merck & Co., Inc., Rahway, N.J.)

**Nov. 1-5—California Section, American Chemical Society.** Pacific Chemical Exposition and Pacific Industrial Conferences, Civic Auditorium, San Francisco. (Marcus W. Hinson, manager, Pacific Chemical Exposition, Hotel Whitcomb, San Francisco 1.)

**Nov. 2—American Iron and Steel Institute.** Regional Technical Meeting, Waldorf-Astoria Hotel, New York City. (George S. Rose, secretary, A.I.S.I., 350 Fifth Ave., New York 1.)

**Nov. 3-4—Purdue University, in cooperation with Michiana and Central Indiana Chapters of American Foundrymen's Society.** Second Annual Metals Casting Conference, Purdue Memorial Union Bldg., Lafayette, Ind. (M. M. McClure, technical extension division, Purdue University, Lafayette, Ind.)

**Nov. 10—American Iron and Steel Institute.** Regional Technical Meeting, Hotel Mark Hopkins, San Francisco. (George S. Rose, secretary A.I.S.I., 350 Fifth Ave., New York 1.)

**Nov. 14-18—Refrigeration Equipment Manufacturers Association.** 6th All-Industry Refrigeration and Air Conditioning Exposition, Auditorium, Atlantic City, N. J. (H. F. Spoehrer, chairman, Show Committee, R.E.M.A., 1346 Connecticut Ave., N.W., Washington 6, D. C.)

**Nov. 25-26—American Foundrymen's Society.** New York Chapters. New York State Regional Foundry Conference, Engineering and Science Campus, Syracuse University, Syracuse, N. Y. (E. E. Hook, general chairman, % Dayton Oil Co., Syracuse, N. Y.)

**Nov. 27-Dec. 2—American Society of Mechanical Engineers.** 1949 Annual Meeting, New York City. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

**Nov. 28-Dec. 3—22nd Exposition of Chemical Industries,** Grand Central Palace, New York City. (Charles F. Roth, manager, International Exposition Co., Grand Central Palace, New York City.)

**Nov. 30-Dec. 2—Society for Experimental Stress Analysis.** Annual Meeting, Hotel New Yorker, New York City. (W. M. Murray, secretary, S.E.S.A., P. O. Box 168, Cambridge 39, Mass.)

## Induction Heat for Forging Cuts Costs In Many Directions

Reported by L. Wiley Cooper  
Iowa State College

At the last meeting of the spring season Des Moines Chapter A.S.M. scheduled a full evening which included election of officers, coffee talk and technical program. H. B. Osborn, technical speaker for the evening, was also requested to present past chairman certificates to Forrest E. Billett, Clarence R. Hall, P. G. Parks and Marvin L. Nelson.

Coffee speaker was Allen E. Towne, district traffic manager for United Air Lines, who presented a Kodachrome motion picture entitled "Highways to Hawaii".

Dr. Osborn, who is technical director of the Tocco Division, Ohio Crankshaft Co., then spoke on "Induction Forging". He stressed the benefits of this method, as compared with the customary use of oil or gas for heating purposes, ending with a comparison of the relative costs of each method.

Inasmuch as no gaseous combustion products are formed with induction heating, it is possible to make a substantial reduction in the original cost of the shop buildings, since elaborate ventilating systems are not required, and the height of the shop ceilings may be lowered. Because the application of heat is confined directly to the forging blank, the shop temperatures can be maintained at much more comfortable levels, especially during the hot summer months. This last factor is admittedly of an intangible nature, yet any installation that contributes to the betterment of working conditions and the welfare of the worker is most desirable in view of present conditions.

Induction heating of forging blanks also provides a direct saving when shutdowns occur, according to Dr. Osborn. In the conventional furnaces, steel is wasted, as well as fuel, when a shutdown occurs and the furnace is permitted to cool. In the induction heating process, only the metal stock is heated and then only when and as it is needed.

Additional savings result from increased die life, less scrap loss, less hammer or press maintenance, no need for skilled operators, and increased productivity.

### New Film on Cranes Offered

A 16-mm. sound film in full color on material handling entitled "Lorain in Industry" has been released by the Thew Shovel Co., Lorain, Ohio. It takes 28 min. to screen and is available for showing on request to Lorain distributors throughout the country.

## THIRTY YEARS AGO

*After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treating Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations.—Ed.*

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The importance of temperature control in heat treatment is reflected in the number of articles on pyrometry published in these early issues. Contributors include: RICHARD P. BROWN, president of Brown Instrument Co.; CHARLES BURTON THWING of Thwing Instrument Co.; R. B. LINCOLN and W. A. GATWARD, both of Hoskins Mfg. Co.; and CLAUD S. GORDON (who, an announcement states, found it necessary to enlarge his Chicago laboratory facilities because of the "increased demand for proper heat treatment of steel, which requires expert pyrometer service.")

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The name of RAY T. BAYLESS appears for the first time on the title page of the *Journal* in March 1919. He is listed as an associate editor under the three-man Publication Committee, consisting of A. F. MACFARLAND, E. J. JANITZKY and F. S. CRANE. At that time Mr. Bayless was still associated with James H. Heron Co., consulting engineers.

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Two new chapters were launched the same month—Philadelphia, under GEORGE W. PRESSELL, chief of the research staff of E. F. Houghton & Co., as chairman, and ARTHUR L. COLLINS, metallurgist, Atlas Ball Co. (now sales manager for Horace T. Potts Co.) as secretary; and Milwaukee, with G. WALTER ESAU, president, Modern Steel Treating Co., (now representing E. F. Houghton & Co. in Buffalo), as chairman, and C. I. WESLEY, secretary of the Wesley Steel Treating Co., as secretary-treasurer (now president of the company he and his father established).

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Other chapters followed in rapid succession in Cincinnati (W. S. SPEAR, metallurgist, Cincinnati Milling Machine Co., chairman), Buffalo (DAVID BELL, president of Bell Co., chairman), Rochester (F. MONROE DALE, chairman, and RALPH C. SCHWARTZ, then of Taylor Instrument Co., now head of his own firm of metallurgical engineers, as secretary), and New York (FRANK P. FAHY, chairman).

(11) OCTOBER, 1949



# CHAPTER MEETING CALENDAR



CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Nov. 9	University Club	H. McQuaid	Steelmaking Practice
Baltimore	Nov. 21		Gregory Comstock	Powder Metallurgy
Boston	Nov. 4	Hotel Sheraton	Mary R. Norton	Metallography
Buffalo	Nov. 16	Kleinhans Music Hall		Television
Calumet	Nov. 8	Phil Smidts		
		Hammond, Ind.	H. K. Ihrig	Hot Workability of Steels
Chicago	Nov. 14	Furniture Mart	Morris Cohen	Tempering of Steel
Cincinnati	Nov. 10	Engineering Society	Charles A. Turner, Jr.	Gradation Heating
Cleveland	Nov. 7	Tudor Arms Hotel	S. L. Hoyt	Metallurgy of Welding
Detroit	Nov. 7	Horace H. Rackham Memorial	M. B. Bever	Carbonitriding
Fort Wayne	Nov. 14	Chamber of Commerce	H. B. Osborn, Jr.	Induction Heating
			Milt Garvin	Flamatic Heating
Georgia	Nov. 7	Town House, Atlanta	C. L. Altenburger	Application and Specification of High Tensile Steel
Indianapolis	Nov. 21	Antlers Hotel	Arthur Focke	Wear and Wear Testing
Lehigh Valley	Nov. 4	Hotel Traylor	R. K. Hopkins	Electric Hot Top Process
Los Alamos	Nov. 16	Civic Club	Arthur F. Underwood	Design Applications of Fatigue Testing
Los Angeles	Nov. 17	Rodger Young Audit.	Hugo W. Hiemke	The Welding of Products From the Metallurgical Viewpoint
Mahoning Valley	Nov. 8	V.F.W. Rooms, Youngstown, Ohio	Karl F. Fethers	High Temperature Chemistry
Montreal	Nov. 7	Queens Hotel	A. H. Thompson	Refractories for the Metal Industry
New Haven	Nov. 17	Burroughs Library Lecture Hall, Bridgeport	J. E. Fifield	Nodular or Ductile Cast Iron
New Jersey	Nov. 21	Essex House, Newark	H. H. Harris	Heat Resisting Alloys
North Texas	Nov. 9	S.M.U., Dallas	C. H. Sample	Corrosion and Protective Value of Metallic Coatings
North West	Nov. 17	Covered Wagon	J. C. Neemes, Jr.	Ductile Cast Iron
Northwestern Pa.	Nov. 17	Meadville	L. P. Tarasov	Injury to Ground Surfaces
Notre Dame	Nov. 9	Engineering Auditorium	N. K. Koebel	Furnace Brazing
Ontario	Nov. 4	Royal Connaught Hotel, Hamilton	J. Howard Stagg	Some Aspects of Toolsteels
Ottawa Valley	Nov. 8	Bureau of Mines	W. T. Muirhead	Fundamentals of Carbide Tool Applications
Peoria	Nov. .			Joint Meeting of All Local Technical Societies
Philadelphia	Nov. 25	Engineers Club	A. E. Focke	Wear and its Alloys
Pittsburgh	Nov. 10	Roosevelt Hotel	C. I. Bradford	Development and Application of Titanium and its Alloys
Purdue	Nov. 15	Purdue Union	R. F. Miller	The Use of Metals at Elevated Temperatures
Rhode Island	Nov. 2	Providence Engineering Society	E. J. Pavesic	Practical Tool and Die Hardening
Rochester	Nov. 12	Lower Strong Audit.	G. E. Brumbach	Toolsteels
Rockford	Nov. 16	Faust Hotel	O. W. McMullan	Fundamentals of Metallography in Shop Practice
Rocky Mt.	Nov. 18	Oxford Hotel, Denver	J. W. Underwood	Modern Bearings and Their Materials
	Nov. 17	Pueblo, Colo.		
Saginaw Valley	Nov. 22	Fischer Hotel, Frankenth, Mich.	W. Bean	Stress Analysis
Southern Tier	Nov. 14	Cornell University	M. Gensamer	Mechanical Properties and Microstructure
Springfield	Nov. 21	Sheraton Hotel		
St. Louis	Nov. 3	Engineers Club	Eugene E. Ayer	Major Sources of Energy
Syracuse	Nov. 1	Onondaga Hotel	R. C. Gibbons	Effect of Microstructure on Machining
Terre Haute	Nov. 7			Petroleum Production
Texas	Nov. 1	Ben Milam Hotel	C. D. Kuhn	Low-Carbon Austenitic Stainless Steel
Toledo	Nov. 2	Toledo Yacht Club	R. G. McElwee	Nodular Iron
Tri-City	Nov. 8	Rock Island Arsenal	G. S. Riegel	Composition and Structure of Steels in Preparation for Machining
Tulsa	Nov. 14	Michaelis Cafeteria	Mr. Chisholm	Corrosion Resistant Superalloys
Utah	Nov. 18	New House Hotel	C. K. Donoho	Ductile Cast Iron
Warren	Nov. 10	El Rio	J. D. Grewell	Human Factors in Management
Washington	Nov. 14	Garden House, Dodge Hotel	L. P. Tarasov	Some Metallurgical Aspects of Grinding
Western Ontario	Nov. 11	Cobblestone Inn, London	G. E. Anderson	Functions of the Major Components of the Gas Turbine
West Michigan	Nov. 21	Morton House	Don McCutcheon	Industrial Application of Radioisotopes
Worcester	Nov. 9	Aurora Hotel	William Mounce	Nickel Steels in Industry
York	Nov. 9	Harrisburg, Pa.	Peter Payson	Fundamentals of Heat Treatment

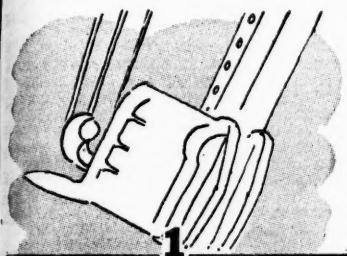
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# A. S. M. Review of Current Metal Literature

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

An Annotated Survey of Engineering,  
Scientific and Industrial Journals  
and Books Here and Abroad,  
Received During the Past Month



## ORE BENEFICIATION and RESERVES

### 1A—General

**1A-40. Radioactive Tracers in Mineral Engineering Problems and Particularly in Flotation.** A. M. Gaudin and P. L. De Bruyn. *Canadian Mining and Metallurgical Bulletin*, v. 42, July 1949, (Transactions of the Canadian Institute of Mining and Metallurgy, v. 52), p. 331-337.

Fundamental properties of stable and unstable isotopes.  $C^{14}$  is being used as a tracer in flotation collectors and a broad study of tracers in mineral engineering.  $Ag^{110}$ ,  $As^{74}$ ,  $Sr^{90}$ ,  $Ba^{140}$ , and  $S^{35}$  have been used to date. Details of methods. 13 ref.

**1A-41. Studies on the Activation of Quartz with Calcium Ion.** Strathmore R. B. Cooke and Marcus Digre. *Mining Engineering*, v. 1, Aug. 1949, (Mining Transactions, v. 184), p. 299-305.

Purpose of investigation was to determine those conditions under which dilute solutions of  $CaCl_2$  will activate quartz for anionic flotation and to determine the amount of calcium ion absorbed by quartz. Primary variables such as Ca, Na and H ion concentrations, were studied. 14 ref.

**1A-42. The Flotation of Quartz Using Calcium Ion as Activator.** Strathmore R. B. Cooke. *Mining Engineering*, v. 1, Aug. 1949, (Mining Transactions, v. 184), p. 306-309.

Experiments using an improved type of cell for the bubble pick-up method devised by Cooke and Digre (see above abstract.) Presents evidence that fine quartz particles can adsorb Ca ions under conditions which prohibit large particles from doing the same.

**1A-43. Energy—New Surface Relationship in Crushing. I. Application of Permeability Methods to an Investigation of the Crushing of Some Brittle Solids.** J. N. S. Kwong, J. T. Adams, Jr., J. F. Johnson, and Edgar L. Piret. *Chemical Engineering Progress* (Engineering Section), v. 45, Aug. 1949, p. 508-516.

Crushing of quartz, fluorite, glass, labradorite, and a few other solids by dropping a steel ball on a piston resting on the material in a steel mortar. Surface areas were measured by the permeability method. 51 ref.

**1A-44. Determination of Reflectivity of the Ore Minerals.** R. E. Folinsbee. *Economic Geology and the Bulletin of the Society of Economic Geologists*, v. 44, Aug. 1949, p. 425-436.

Increasing sensitivity and reliability of exposure meters used in photography provides a simple and convenient method for the above. Relative reflecting powers of some 200 high-index nonopaque and opaque mineral species were determined with a General Electric exposure meter coupled to a metallographic microscope. Values obtained agree well. Reflecting powers of common species of opaque or nearly opaque native elements, sulfides, sulfosalts, and oxides are tabulated.

**1A-45. Neue Aufbereitungs-Versuchsmaschinen.** (New Ore-Dressing Testing Machines.) W. Gründer and H. Simon. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, May 1949, p. 139-144.

A new screen-clamping device, a triple-tube sorting device, hydro-separators for investigating sludge, experimental wet and air-settling equipment, a new "basket separator", a vacuum pyrometer, and experimental flotation cells.

**1A-46. Viskositätsmessungen von Erträgen.** (Viscosity Measurements on Ore Sludges.) Günther Flugge. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, June 1949, p. 174-177.

Construction and operation of a stirrer viscosimeter which is useful for controlling grinding and classifying processes. It is claimed to be sufficiently accurate and more rapid than sieve analysis.

**1A-47. Electrostatic Separation.** Fred D. Kay. *Mining Congress Journal*, v. 35, Aug. 1949, p. 26-27, 51.

As applied to separation of rutile and zircon. Data are believed to be of value to producers treating ores that contain minerals having different electrical conductivities.

**1A-48. Infra-Red Heater Lowers Concentrate Drying Costs.** J. T. Hanvey, Jr. *Engineering and Mining Journal*, v. 150, Sept. 1949, p. 82-83.

Heater has been found effective and comparatively inexpensive in drying gravity and flotation concentrates. Treating 3-4 tons of high-grade concentrate per day, the heat lamps reduce its moisture content to less than 0.02% at a cost of \$1.85 per ton.

**1A-49. Aufschluss von Bauxit mittels dünner Sodaaflösungen und Gewinnung reiner Tonerde aus diesen Lösungen.** (Dissolving Bauxite With Dilute Soda Solutions and Extracting Alumina

From These Solutions.) W. Fulda. *Metall*, Dec. 1948, p. 397-399.

How the method differs from the Bayer process.

**1A-50. Die Anwendung der Setzarbeit in der Erzaufbereitung.** (The Use of Heavy-Density Media in Ore Dressing.) Franz Langer. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, July 1949, p. 205-210.

Reviews the literature. New heavy-density separators. 41 ref.

**1A-51. Role of Gases and New Reagents in Flotation Processes.** (In Russian.) I. I. Kurenkov. *Vestnik Akademii Nauk SSSR* (News of the Academy of Sciences of the USSR), Apr. 1949, p. 67-69.

Proceedings of meeting at which 15 papers covering all phases of flotation processes were presented.

### 1B—Ferrous

**1B-56. Rotary-Kiln Nodulizing Is Simple, Costs Less.** H. Berg. *Engineering and Mining Journal*, v. 150, Aug. 1949, p. 56-58.

Experience with iron-ore fines and blast-furnace flue dust at European plant is cited to show advantages of nodulizing in a rotary kiln.

**1B-57. Quebec-Labrador as a Future Supply of Iron Ore for the United States.** Norwood B. Melcher. *Skills' Mining Review*, v. 38, Aug. 6, 1949, p. 1, 4, 6-7. Reprinted from *Mineral Trade Notes*, Special Supplement No. 29 to v. 27, Oct. 1948.

### 1C—Nonferrous

**1C-58. Prospecting for Uranium.** 123 pages. 1949. U. S. Atomic Energy Commission and U. S. Geological Survey, Washington.

Uranium-bearing minerals. Types of deposits, tests for U, and prospecting with the Geiger counter. Laboratory assay and selling procedures, and laws and regulations.

**1C-59. Semi-Pilot-Plant Tests on Treatment of Manganese-Silver Ores by the Dithionite Process.** S. F. Ravitz, A. E. Back, K. E. Tame, W. F. Wyman, and J. L. Dewey. *U. S. Bureau of Mines*, Technical Paper 723, 1949, 45 pages.

The development and operation of a continuous semi-pilot plant for treating ores, and results obtained with specific ores. 20 ref.

**1C-60. Sources of Rhenium.** J. G. F. Druce. *Industrial Chemist and Chemical Manufacturer*, v. 25, July 1949, p. 348.

Various investigations carried out in the search for compounds of rhenium.

**1C-61. High Recovery at the Silver Standard.** H. M. Wright. *Western Miner*, v. 22, Aug. 1949, p. 42-48.

Details of 60-ton-per-day silver-

lead-zinc operation with additional values in gold and cadmium, located in north-central British Columbia.

**1C-62. The Granby Story: Granby Milling Operations.** L. H. McKay. *Western Miner*, v. 22, Aug. 1949, p. 60, 62.

Equipment and procedures of copper concentrators at two locations in Western Canada.

**1C-63. Laboratory Ore Testing Procedure. Part III.** Clarence Thom. *Deco Trefoil*, v. 13, July-Aug. 1949, p. 7-10.

Machines and procedures used in carrying out a cyanide test in an ore-dressing laboratory.

**1C-64. Magma Copper's New Mill.** *Mining World*, v. 11, Sept. 1949, p. 16-19. Mill designed and constructed to provide maximum output for a convertible Cu-Zn flotation circuit. Flow diagrams.

**1C-65. Influence de la préparation mécanique sur l'amalgamation de l'or.** (Influence of Mechanical Preparation on the Amalgamation of Gold.) Alexandre Prigogine. *Revue de Métallurgie*, v. 46, May 1949, p. 269-276.

Results on four different types of ore from South Africa indicate that method of ore dressing and other related factors, such as degree of grinding and temperature, have a large influence on the percent of gold extraction by amalgamation.

**1C-66. Origin of the Natural Hydrophobic Nature of Sulfide Minerals Under Flotation Conditions.** (In Russian.) I. N. Plaksin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 91-93.

Experimental investigation indicates that the flotability of sulfide minerals is mostly related to the edge angle of wetting, variation of which is related to the oxygen adsorbability of the mineral and metal surfaces. Influence of time of contact of such surfaces with air and water on the value of the edge angle of wetting is established.

**1C-67. Selektive Flotation der Blei-Zink-Kupfererze von Tsumeb durch kombinierte Cyan-Bichromat-Trennung.** (Selective Flotation of Tsumeb Lead-Zinc-Copper Ores by the Combined Cyanogen-Dichromate Separation Process.) A. Götze. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 185-187.

Claimed to be a more efficient, economical, and simpler method for these Cu-containing Zn-Pb ores.



## SMELTING, REDUCTION and REFINING

### 2A—General

**2A-8. Thermodynamics of Basic Metallurgical Slags.** (In Russian.) V. A. Kozhevnikov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Apr. 1949, p. 484-496.

Using as an example the distribution of oxygen between metal and basic slags, consisting of FeO, MnO, CaO, MgO, and SiO<sub>2</sub>, it is shown

that, during determination of the thermodynamic properties of siliceous systems, they should be considered as consisting only of the simplest ions. 14 ref.

**2A-9. Sur la chimie des solutions métalliques diluées.** (Chemistry of Dilute Metallic Solutions.) Léon Jollivet. *Comptes Rendus* (France), v. 228, June 20, 1949, p. 1944-1946.

A theoretical analysis of refining processes based on addition to molten metals of certain elements. A formula is deduced for the relation between concentration of added elements, concentration of the base metal, and absolute temperature of the process. From this formula composition of the resulting compounds and heats of their formation may be determined.

**2A-10. Influence de l'intervalle de solidification sur la coulabilité des laitiers sidérurgiques.** (Influence of Solidification Range on the Fluidity of Metallurgical Slags.) Paul Bastien. *Comptes Rendus* (France), v. 229, July 4, 1949, p. 50-51.

Attempts to establish laws governing the above, similar to those already established for metallic alloys. Experimental data agree with theoretical conclusions.

### 2B—Ferrous

**2B-227. Another Look at the Problem of Steel Deoxidation.** John Chipman. *Metal Progress*, v. 56, Aug. 1949, p. 211-221.

Many discrepancies between the results of experiments and thermodynamic computations can be ascribed to the ability of an alloying element to share electrons with oxygen, as do the surrounding iron atoms, thus tying up the oxygen and reducing its activity. These relationships are shown quantitatively for the common alloying elements in steel. 16 ref.

**2B-228. Chromium-Oxygen Relations in Liquid Steel.** John Chipman. *Metal Progress*, v. 56, Aug. 1949, p. 216B.

Shown by means of several graphs.

**2B-229. Sulphur in Basic Iron and Steel.** H. E. Warren, Jr. *Journal of Metals*, v. 1, sec. 1, Aug. 1949, p. 6-8; discussion p. 8-10.

Disposition of sulfur in iron and factors which affect sulfur in steel. Data were taken from 24 casts from blast furnaces which were arbitrarily operated to produce high-sulfur iron. No relationship was found between sulfur in the iron and the melt and ladle sulfurs.

**2B-230. Equilibrium in the Reaction of Hydrogen With Oxygen in Liquid Iron.** Minu N. Dastur. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (Metals Transactions, v. 185), p. 441-445.

An experimental study. Errors of thermal diffusion in the gas mixture were eliminated by preheating the entering gas stream to the temperature of the metal. A further safeguard was admixture of pure argon in a ratio of about 4 to 1. 14 ref.

**2B-231. Deoxidation of White Cast Iron—An Interpretation Applied to Malleable Irons.** Richard W. Heine. *Foundry*, v. 77, Aug. 1949, p. 74-78, 229-230.

Some phases of the effects of oxygen as revealed by deoxidizing treatments applied to white cast irons. Deoxidizing additions of aluminum, 40% ferrotitanium, a special 40% Zr alloy, or hydrogen were made. Test pieces from each heat were given an annealing treatment to show the effects of the deoxidation treatments on first-stage graphitization. A relationship was found between the extent of deoxidation and some basic fundamentals of the graphitizing process. (To be concluded.)

**2B-232. Distribution of Oxygen Between Molten Iron and Iron Oxide-Silica Slags.** Gerhard Derge. *Industrial Heating*, v. 16, Aug. 1949, p. 1396, 1398, 1400, 1402, 1404, 1436.

Use of a rotating induction furnace with a heavy-walled, fused-silica crucible and an iron liner at the slag line, for studying reactions between molten iron and slags of the iron-oxide-silica system which are not saturated with silica. Various heats were analyzed for oxygen and silicon contents. Graphs give % O<sub>2</sub> in the metal plotted vs. % S in the metal and % FeO in the slag. New information on the molecular constitution of iron silicate slags is derived from the data.

**2B-233. The CaO-MgO-Cr<sub>2</sub>O<sub>3</sub> Ternary System. Part II. Further Experiments.** W. J. Ford and W. J. Rees. *Transactions of the British Ceramic Society*, v. 48, Aug. 1949, p. 291-321.

Some properties of the three compounds obtainable on heating mixtures of lime and chromic oxide in air. X-ray study of the dissociation of CaCr<sub>2</sub>O<sub>4</sub> in vacuum gave evidence for the constitutions of the complex compounds formed in air below the temperature at which liquid is produced. Phase distribution was determined in air at various temperatures, and in vacuum. Application of the diagram to the working of high Cr steels. Appendix by J. White consists of a theoretical interpretation of the experimental data on the above system.

**2B-234. Pig Iron From Iron and Steel Swarf.** *Iron Age*, v. 164, Aug. 18, 1949, p. 104. Based on article in *Iron & Coal Trades Review*, July 8, 1949.

Results obtained with a 30 to 40-ton per day blast furnace in Hungary.

**2B-235. Experiments on the Gas and Fluid Flow in a Side-Blown Converter Model.** M. P. Newby. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 452-456.

In order to throw light on the movements of metal, slag, and blast, experiments were carried out on a small-scale model at room temperature. Existence of a back eddy filling a large portion of the chamber was demonstrated, and it is thought that the heavy wear on the lining, which occurs on the back wall above the tuyeres, may be associated with a recirculating stream of hot gas which strikes the wall in this region.

**2B-236. Observations at the Stockline in a Driving Blast-Furnace. A Technique for Determination of Contour, Movement, and Gas Composition.** E. W. Voce. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 450-451.

Apparatus and typical results. Determination of temperatures is also believed possible.

**2B-237. Bessemer Steelmaking. Comprehensive Report of the B.I.S.R.A. Sub-Committee.** *Iron and Steel*, v. 22, July 1949, p. 354-358; Aug. 1949, p. 377-382, 384.

Various processes and possible combinations. Uses of bessemer steel and possible lines of research. Aug. installment: American practice and suggestions for future developments, including oxygen enrichment.

**2B-238. Teeming Practice: Overcoming Difficulties in the Production of Good Ingots.** N. H. Bacon. *Iron and Steel*, v. 22, Aug. 1949, p. 372-376.

Practical problems. (To be concluded.)

**2B-239. Addition of Steam to Blast Furnace.** *Metal Progress*, v. 56, Aug. 1949, p. 234, 236. Translated and condensed from "Catalysts for the Reduction Process in Blast Furnaces," M. I. Korobova and N. I. Korobov, *Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk* (Bulletin

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of the Academy of Sciences of the USSR, Section of Technical Sciences), 1946, p. 567-577.

Value of hydrogen as a "catalyst" for the reduction of FeO. Experience with addition of steam to the blast, from which H<sub>2</sub> is produced inside the furnace by reduction with CO or C. Contrary to American experiences, the furnaces ran more evenly and coke consumption per ton of iron was decreased.

**2B-240.** Vyroba ocele pri zvyšených sazkach suroveho zeleza. (Steel Production With High Pig-Iron Charges.) Alois Emil Dobner. *Hutnické Listy*, v. 4, May 1949, p. 133-139.

An openhearth process using 60% pig-iron is based on the Monell and Bertrand-Thiel processes, which use up to 80% pig iron. The method involves a time separation of ore and lime boils and almost complete exclusion of Si and P from the slag.

**2B-241.** Karburierungsversuche mit Steinkohlenstaub im koksofengasbeheizten Siemens-Martin-Ofen. (Carburizing Tests With Anthracite Coal Dust in an Openhearth Furnace Heated by Coke-Oven Gas.) Ernst Meier-Cortes. *Stahl und Eisen*, v. 69, July 7, 1949, p. 476-480.

Equipment and procedures for carburizing steels with anthracite.

**2B-242.** Berechnungsverfahren zur Überprüfung von Fehlerquellen in den Betriebsergebnissen von Hochöfen. (Calculation Methods for Control of Sources of Error in Blast Furnace Operation.) Fritz Wesemann and Karl Kessels. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 211-218.

Develops, by means of materials balances, a method of controlling blast furnace operations and a uniform but simple method for computing important operating data. A chart shows the gravity and composition of the throat gases.

**2B-243.** Oxygen in Steel Producing Furnaces. G. D. Stone. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 56-57; discussion, p. 58.

Some general conclusions drawn from thousands of heats made under a wide variety of conditions. Some of the apparatus evolved from this experience. Indicates that it may be more economical to use smaller flows and quantities than that used in the earlier development work.

**2B-244.** Increasing Open Hearth Production by Use of Oxygen. Better Refractories and Control of Slag. Erle G. Hill. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 85-89. A condensation.

Previously abstracted from *American Iron and Steel Institute*, Preprint. See item 2B-151, 1949.

**2B-245.** Finished Steel Production—Possible Increase From Existing Equipment. R. F. Passano. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 92-96. A condensation.

Previously abstracted from *American Iron and Steel Institute*, Preprint. See item 2B-149, 1949.

**2B-246.** Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 96-97. A condensation.

Previously abstracted from *American Iron and Steel Institute*, Preprint. See item 2B-150, 1949.

**2B-247.** Sulphur Control and Manganese Conservation in Open Hearth Furnaces. D. E. Babcock. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 97-98. A condensation.

Previously abstracted from *American Iron and Steel Institute*, Preprint. See item 2B-205, 1949.

**2B-248.** Economic and Safety Advantages Seen for Improved Nodulizing Alloy. E. T. Myskowski and R. P. Dunphy. *Steel*, v. 125, Sept. 5, 1949, p. 82-83, 114, 116.

New Fe-Si-Mg alloy just announced by Naval Research Laboratory in Washington contains approximately 8% Mg in a 50% ferrosilicon carrier. Show nodulizing effects on the graphite and tensile strengths. Cost advantages and elimination of processing hazards.

**2B-249.** A Graphite Nodulizing Alloy. E. T. Myskowski and R. P. Dunphy. *Iron Age*, v. 164, Sept. 8, 1949, p. 78-79. See preceding abstract (item 2B-248).

**2B-250.** Deoxidation of White Cast Iron. (Concluded.) Richard W. Heine. *Foundry*, v. 77, Sept. 1949, p. 84-85, 239-243.

Practical application and interpretation of principles dealt with in Aug. issue. Use of deoxidizers and relative deoxidizing properties of various elements.

**2B-251.** Nodular Graphite Cast Iron. C. K. Donoho. *Pig Iron Rough Notes*, v. 109, Summer 1949, p. 3-7.

Produced by use of several Mg alloys.

**2B-252.** Blast-Furnace Control Via the Tuyeres. Tom Bishop. *Metal Progress*, v. 56, Sept. 1949, p. 359-360.

Introduction of lime through the tuyeres has proven practical in preliminary tests. Possibility of extension to powdered ore, fuel, and high-pressure air or oxygen, by use of suitably designed tuyeres.

**2B-253.** High-Cr Steel in Acid Arc Furnace. D. C. Hilty. *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 20-23.

Chromium and carbon content and bath temperature at the end of the oxygen blow show that the equilibrium relationships previously shown for basic arc furnaces are also true in acid arc furnaces. One of three trial heats in which Al was fed to the oxidized slag indicated an increase in recovery of Cr from scrap charged. One heat, purposely melted in at higher carbon than usual, gave an indication of possible time saving. Ferrosilicon and lime were ineffective in reducing Cr from the acid slag.

**2B-254.** "15-Minute Pig Iron". *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 24.

Process recently announced is now on a pilot-plant scale of 500 lb. per hr. Operation is automatic from crushed iron to briquettes, through a preheating oven and an electric furnace. Possible disadvantages.

**2B-255.** Report on the Bessemer Process. *Iron and Steel Institute* (London). Special Report No. 42, May 1949, 80 pages.

Part 1: British practice, with sections on basic, acid, surface-blown converter, and multiplexing processes. Part 2: foreign practice, with sections on Swedish, German, and American practice. Part 3: possible future developments. Appendices describe several British plants, list of plants in Britain and abroad, and references (with abstracts) to recent literature (1947 to date).

## 2C—Nonferrous

**2C-4.** Investigation of the Kinetics of Precipitation of Metals from Solutions for Application to the Theory of Hydrometallurgical Processes. (In Russian.) I. N. Ploksin and N. A. Suvorovskaya. *Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Mar. 1949, p. 407-412.

Performed experimental investigation permits establishment of two types of precipitation processes: one with more or less marked liberation of hydrogen, and one without such.

Mechanisms of both processes. Data from a typical application of this method (precipitation of Cu by Fe or Zn from HCl or H<sub>2</sub>SO<sub>4</sub>).

**2C-45.** Production of Titanium Powder at Boulder City. F. S. Wartman. *Office of Naval Research*, "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 20-25; discussion p. 25-26. See abstract from *Metal Progress*, item 2D-8, 1949.

**2C-46.** Production and Properties of Iodide Titanium. Bruce W. Gonser. *Office of Naval Research*, "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 60-68; discussion p. 68-69. See abstracts from *Metal Progress*, items 2D-9 and 3C-55, 1949.

**2C-47.** Lower Oxides of Titanium in Slags of the Aluminothermic Process. (In Russian.) D. S. Belyankin, V. V. Bogolyubov, and V. V. Lapin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser. v. 65, Apr. 11, 1949, p. 685-688.

The possibility of the presence of TiO and Ti<sub>2</sub>O<sub>3</sub> in above slags (aluminothermic reduction of titanium ores) was experimentally investigated. These compounds were found to exist, as shown by microscopic examination.

**2C-48.** Spectrographic Control in the Refining of Metals. D. M. Smith. *Institution of Mining and Metallurgy*, Preprint No. 1 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 10 pages.

Spectrographic detection and estimation of impurities in metals. Limits of detection, examples of control with various metals, and accuracy. 19 ref.

**2C-49.** The Refining of Gold and Silver. A. E. Richards. *Institution of Mining and Metallurgy*, Preprint No. 2 from symposium, "The Refining of Nonferrous Metals", July 1949, 47 pages.

Methods and underlying principles involved.

**2C-50.** The Refining of Bismuth. Alan R. Powell. *Institution of Mining and Metallurgy*, Preprint No. 3 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 9 pages.

Methods and underlying principles. 14 ref.

**2C-51.** Problems in the Production of Some of the Rarer Metals. Alan R. Powell. *Institution of Mining and Metallurgy*, Preprint No. 4 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 15 pages.

For the following processes: electrolysis from aqueous solutions and fused electrolytes, high-temperature reduction processes, and thermal-dissociation methods.

**2C-52.** The Fire Refining of Copper. H. J. Miller. *Institution of Mining and Metallurgy*, Preprint No. 6 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 40 pages.

Refining of Cu by furnace methods, and subsequent casting of the metal into products. 37 ref.

**2C-53.** The Refining of Lead and Associated Metals at Port Pirie, South Australia. Frank A. Green. *Institution of Mining and Metallurgy*, Preprint No. 9 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 36 pages.

Metallurgical operations which include roasting and sintering of concentrates and other raw materials; blast-furnace smelting of sintered material; and refining of base lead bullion.

**2C-54.** Refining of Zinc. Stanley Robson. *Institution of Mining and Metallurgy*, Preprint No. 10 from symposium on "The Refining of Non-Ferrous Metals", July 1949, 16 pages.

Methods and equipment.

2C-55. The Aluminothermic Process and the Preparation of Commercially Pure Chromium, Manganese and Special Alloys such as Ferro Columbium. T. Burchell. *Institution of Mining and Metallurgy*, Preprint No. 15, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 20 pages.

History and general practices.

2C-56. Low-Carbon Ferro Chrome. J. A. Blake. *Institution of Mining and Metallurgy*, Preprint No. 16, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 9 pages.

Process (based on the Ferrin process) for eliminating carbon from the final product.

2C-57. Cobalt Refining at Rainham Works of Murex, Ltd. P. S. Bryant. *Institution of Mining and Metallurgy*, Preprint No. 17, from symposium, "Refining of Non-Ferrous Metals", July 1949, 15 pages.

Separation of Cu, Fe, and of Co as a basic carbonate; calcination to gray or black oxides, purification of oxide; recovery of Co from leach liquors; and reduction of oxide to metallic globules and powders.

2C-58. Tungsten: Its Preparation for Use in Electronics and Carbide Products. T. F. Smeaton. *Institution of Mining and Metallurgy*, Preprint No. 18, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 20 pages.

Production of pure W from natural raw materials.

2C-59. The Production of Ductile Zirconium. G. L. Miller. *Institution of Mining and Metallurgy*, Preprint No. 19 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 12 pages.

History and current processes. 25 ref.

2C-60. Thermodynamics and Metallurgy of Tin Bronzes. Henry Lepp. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 67-76.

Applies the laws of thermodynamics to the Cu-Sn system and to the production of bronze alloys. Dominant reactions recurring in the production of the alloys and at various temperatures. Control of undesired reactions and the theoretical principles of refining and degassing by selective oxidation. 16 ref.

2C-61. Electrolytic Zinc Plant. Joseph S. Bowman. *Electrical Engineering*, v. 68, Aug. 1949, p. 673-676.

Electrolytic process used in the production of metallic zinc at an electrolytic zinc plant. Electrical features.

2C-62. The Use of Oxygen-Enriched Air in the Metallurgical Operations of Cominco at Trail, B. C. R. McNaughton, T. H. Weldon, J. H. Hargrave, and L. V. Whitton. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 446-450.

Use in the suspension roasting of zinc concentrates and in operations at the lead smelter. Precautions necessary for safe use of oxygen in any plant operation.

2C-63. A Thermodynamic Investigation of the System Silver-Silver Sulphide. Terkel Rosenqvist. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 451-460.

Apparatus in which the equilibrium gas ratio was obtained by circulating the gas mixture over the specimen, and the composition of the latter determined from its density by means of a buoyancy-balance. 22 samples containing up to 33.3 atomic % S were studied over the range 500-1300° C. Thermodynamic properties were calculated and relation between them and structure discussed. 18 ref.

2C-64. Autogenous Roasting of Low Grade Zinc Concentrate in Multiple Hearth Furnaces at Risdon, Tasmania.

J. A. B. Forster. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 461-471.

Equipment and procedures.

2C-65. El Paso Slag Treatment Plant. T. J. Woodside. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 472-474.

Deals with a slag containing 10% Zn, from the lead blast furnace.

2C-66. Die Entwismutierung nach dem Kroll-Betterton-Verfahren. (Removing Bismuth by the Kroll-Betterton Process.) Dietrich Evers. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, May 1949, p. 129-133.

An improved method by which the bismuth content of lead can be reduced to less than 0.01%.

2C-67. Thermodynamische Betrachtungen zum Kroll-Verfahren. (Thermodynamic Observations on the Kroll Process.) Hans Grothe. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, June 1949, p. 177-181.

Reactions resulting from introduction of Ca and Mg into the Bi-containing lead bath and phase equilibria in the Pb-Bi-Ca-Mg system. Conclusions regarding the amount of additions required for producing a lead with less than 100 g. per ton of Bi.

2C-68. Über die Oxydation ruhender Bleischmelzen. (The Oxidation of Static Lead Melts.) Wolfgang Gruhl. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 225-240.

The oxidation of pure Pb in air; structure of the oxide films and their effect on slagging; oxidation in pure oxygen; and effects of small additions of Li, Na, Mg, Ca, Al, Ca, Zn, Sn, Sb, Bi, Cu, and Ag. Method of experimentation and test results. 18 ref.

2C-69. Endothermické reakce se současným vyvinem plynu. (Endothermic Reactions With Simultaneous Evolution of Gas.) A. Krupkowi and J. Zemelka. *Hutnické Listy*, v. 4, Mar. 1949, p. 79-83.

An upper isothermal temperature of reaction can be distinguished, which is always above the equilibrium temperature. The difference between these temperatures characterizes the degree of superheating which exists. Experiments with reduction of ZnO with coal and coke, or charcoal, showed that reduction takes place below the upper isothermal limit, hence the rate is very slow. Increasing the rate of reduction was found to be difficult.

2C-70. Experiments on the Removal of Selenium and Tellurium From Blister and Fire-Refined Copper. W. A. Baker and A. P. C. Hallows. *Bulletin of the Institution of Mining and Metallurgy*, Aug. 1949, p. 1-14.

Laboratory experiments on removal during conversion of matte by volatilization and by selective converting. Removal during fire-refining by addition of calcium and other elements. Some of the methods are believed applicable to full-scale working conditions.

2C-71. Preparation of Zinc by Electrolysis. Duisburger Kupfer Hütte, Duisberg. H. Shaw and O. Whitson. British Intelligence Objectives Sub-Committee, Final Report No. 930, Item No. 22, Nov. 29, 1945, 14 pages.

Preparation of pure zinc and burnt ore treatment at the Duisburger Copper Plant, Duisberg, Germany.

2C-72. High Temperature Equilibria in Metal-Metal Halide Systems. D. Cubicciotti. U. S. Atomic Energy Commission, MDDC-1058, June 1946, 20 pages.

Solution of metal in molten salt makes electrolysis of fused salts inefficient or, in some cases, impossible. Therefore, the solubility of a metal in a salt and factors influencing it

are of some concern in electrochemical reduction from fused baths. Data mainly on the alkaline-earth metals and their halides. 46 ref.

2C-73. Über die Refinement von Zink und Zinklegierungen. (The Refining of Zinc and Zinc Alloys.) M. Schmidt. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 193-194.

Effects of impurities on the properties of refined Zn. Methods of removing Al by metals of the iron group and of liquating Al and Fe in two steps.

2C-74. Über die Herstellung von Mangankupfer aus Hochofen-Ferromangan. (The Production of Manganese-Copper From Blast Furnace Ferromanganese.) Wolfgang Gruhl. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, July 1949, p. 197-205.

Proposed liquation process which permits reduction of the Fe and C contents to a satisfactory degree. An alloy with 27% Mn and 2% Fe is found to have the optimum Mn-Fe ratio, but a small addition of Si will reduce the Fe content still further. Includes Mn-Cu-Fe phase diagram.

2C-75. Low Pressure Distillation of Zinc from Al-Zn Alloy. Max J. Spendlove and Hillary W. St. Clair. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 553-560.

First of a series on separation of nonferrous metals by distillation at low pressures. Although the experiments were confined to separation of Zn from Al, significance of the results is not confined to these metals. Distillation furnace and method for measurement of temperature and pressure.

2C-76. Antimony Production. W. H. Dennis. *Mine & Quarry Engineering*, v. 15, Sept. 1949, p. 289-296.

Occurrence, ore concentration, and various methods for production of the metal.

2C-77. Refining Metal Melts; Adaptation of Wet-Method Chemical Filtration. Reinacher. *Metal Industry*, v. 75, Sept. 2, 1949, p. 183-187.

Removal of iron and oxide impurities from Zn alloys; filtration of hyper-eutectic Al-Fe alloys and reduction of the Fe content of Al alloys by liquation and filtration after addition of Mg. Apparatus and methods used and results obtained.

## 2D—Light Metals

2D-20. Tensione di decomposizione della allumina e meccanismo della elettrolisi nei forni industriali. (Decomposition Tendency of Alumina and Mechanism of Its Electrolysis in Industrial Furnaces.) A. Vayna. *Alluminio*, v. 18, Mar.-Apr. 1949, p. 147-152.

Reviews and comments critically on work of Cadariu, Gadeau, and Ferrand (presented in 1947).

2D-21. The Refining of Magnesium. E. F. Emley. *Institution of Mining and Metallurgy*, Preprint No. 12 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 31 pages.

Removal of insoluble nonmetallic impurities, removal of dissolved impurities other than gases; and degassing and grain refinement. 77 ref.

2D-22. Refining of Aluminum. J. Waddington. *Institution of Mining and Metallurgy*, Preprint No. 13, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 16 pages.

Reviews various processes. 21 ref.

2D-23. Catalytic Distillation of Aluminium. P. Gross. *Institution of Mining and Metallurgy*, Preprint No. 14, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 10 pages.

Investigations carried out at the Fulmer Research Institute in England. Underlying theory.

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2D-24. The Elements Present in Alumi-  
nium Casting Alloys With Some Notes  
on Methods for Their Introduction.  
D. C. G. Lees. *Murex Review*, v. 1,  
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2D-25. Traction, Alloying and Fabri-  
cation of Magnesium. C. J. P. Ball.  
*Engineering*, v. 168, Aug. 5, 1949, p. 125-  
126; Aug. 19, 1949, p. 185-186. A con-  
densation.

2D-26. Heat Contents and Heat of  
Formation of Magnesium Nitride; High  
Temperature Measurements. D. W.  
Mitchell. *Industrial and Engineering  
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cerned with the production of mag-  
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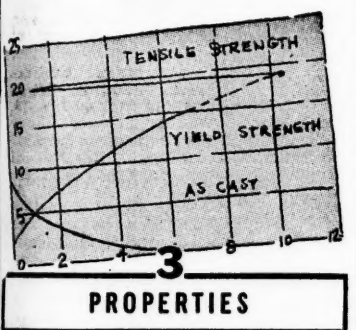
2D-27. Über die Kornverfeinerung von  
Magnesium-Gusslegierungen. (The  
Grain Refining of Cast Magnesium Al-  
loys.) G. Siebel. *Metall*, Nov. 1948, p.  
357-363.

Effects of melting conditions, com-  
position, superheating, chlorine, in-  
organic chlorides, organic chlorides,  
and other organic substances on  
grain structures and strength prop-  
erties of Mn alloys. 10 ref.

2D-28. Die Entgasung von Aluminium-  
legierungen (Versuche mit Chlor und  
Hexachloräthan). [The Removal of  
Gases From Aluminum Alloys (Experi-  
ments With Chlorine and Hexachloro-  
ethane).] M. Grand. *Metall*, Dec. 1948,  
p. 406.

Some experimental results.

For additional annotations in-  
dexed in other sections, see:  
14A-111; 15-61-62-63; 16A-87;  
16B-85



### 3A—General

1A-157. Problems of the "Wettability"  
of Metals and Bearing Alloys. (In  
Russian.) M. E. Drits. *Izvestiya Aka-  
demii Nauk SSSR, Otdelenie Tekh-  
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Academy of Sciences of the USSR,  
Section of Technical Sciences) Mar.  
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The edge angle of wetting de-  
pends on the chemical composition  
of the metal, the condition of the  
surface, the viscosity of the oil, the  
time, and the temperature.

1A-158. Concerning Application of a  
Theory of Disorder to Polar Models  
of Metals. (In Russian.) N. N. Bogoly-  
ubov and S. V. Tyablikov. *Zhurnal  
Eksperimental'noi i Teoreticheskoi Fi-  
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Theoretical Physics) v. 19, Mar. 1949,  
p. 251-255.

A theoretical, mathematical analy-  
sis.

1A-159. Approximate Method of De-  
termination of Low-Energy Levels of  
Electrons in Metals. (In Russian.) N.  
N. Bogolyubov and S. V. Tyablikov.  
*Zhurnal Eksperimental'noi i Teoret-*

*cheskoi Fiziki* (Journal of Experi-  
mental and Theoretical Physics), v.  
19, Mar. 1949, p. 256-268.

An approximate secondary quan-  
tum method for determination of  
the energy spectrum of low states  
of excitation. Results are illustrat-  
ed in connection with the theory of  
ferromagnetism.

3A-160. Generalization of the Statis-  
tical Theory of Toughness for the Case  
of Non-Uniformly Stressed States. (In  
Russian.) T. A. Kontorova and O. A.  
Timoshenko. *Zhurnal Tekhnicheskoi  
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v. 19, Mar. 1949, p. 355-370.

Mathematical treatment of prob-  
lem which attempts to generalize  
the statistical theory previously pro-  
posed.

3A-161. Variations in the Mechanical

Properties of Metals Under Hydro-  
static Pressure. (In Russian.) S. I.  
Ratner. *Zhurnal Tekhnicheskoi Fiziki*  
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Mar. 1949, p. 408-411.

Investigated for Cu, Mg and Mg  
alloys, Be bronze, a cast Al alloy,  
and Si-Cu-Mg-Zr alloys. Under the  
influence of hydrostatic pressure,  
not only tensile strength and yield  
point, but also resistance to plas-  
tic deformation are altered. The  
amount of the change is related  
to the structure of the metal.

3A-162. Experimental Confirmation of  
the Basic Laws of the Theory of Plas-  
ticity. (In Russian.) S. T. Kishkin  
and S. I. Ratner. *Zhurnal Tekhnicheskoi  
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ics), v. 19, Mar. 1949, p. 412-420.

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# RYERSON STEEL

(17) OCTOBER, 1949

- the condition of plasticity of St. Venant and Huber-Mises. It is shown that, in the general case, these conditions are not valid; and are correct only in particular cases. Results of experiments on a series of ferrous and nonferrous metals and alloys.
- 3A-163. The High Frequency Skin Resistance of Metals at Low Temperatures.** (In English.) A. B. Pippard. *Physica*, v. 15, Apr. 1949, p. 45-54.  
Theoretical analysis and experimental results obtained on a number of metals, both superconducting and normal, at temperatures down to 4° K. or lower.
- 3A-164. Superconductivity.** (In English.) C. J. Gorter. *Physica*, v. 15, Apr. 1949, p. 55-64.  
Developments since 1934, indicating problems yet to be solved. 29 ref.
- 3A-165. The Casimir Method of Studying Penetration Depths in Superconductors.** (In English.) D. Shoenberg. *Physica*, v. 15, Apr. 1949, p. 71-75.  
Results of experimental and theoretical analysis. Errors are shown to be likely to be over rather than underestimates. A method described by Shalnikov and Sharin. (Moscow, 1948.)
- 3A-166. Sur des courants normaux à la fois aux gradients de potentiel et de température.** (Concerning Currents Normal to the Time of Potential and Temperature Gradients.) Albert Perrier. *Physica*, v. 15, Apr. 1949, p. 76-79.  
Effects predicted and subsequently observed by the author several years ago. A brief qualitative description and a summary of quantitative characteristics determined for iron and nickel. Theoretical bases.
- 3A-167. Relaxation Phenomena in Metals.** (In English.) Clarence Zener. *Physica*, v. 15, Apr. 1949, p. 111-118; discussion p. 118.  
Information obtained from a study of mechanical relaxation, and current metallurgical problems which may be aided by further study of mechanical relaxation.
- 3A-168. Mechanical Properties of Metals.** (In English.) N. F. Mott. *Physica*, v. 15, Apr. 1949, p. 119-128; discussion p. 129-133.  
Mechanism of slip in crystals or crystalline grains, physical causes of hardness, grain-boundary slip, recovery, and recrystallization. 16 ref.
- 3A-169. The Present Status of the Theory of Ferromagnetism.** (In English.) J. H. Van Vleck. *Physica*, v. 15, Apr. 1949, p. 197-205; discussion p. 205-206.  
18 references.
- 3A-170. Ferromagnetic Domains.** (In English.) R. M. Bozorth. *Physica*, v. 15, Apr. 1949, p. 207-219.  
Recent theoretical and experimental work at Bell Telephone Laboratories. Forces to be considered in analysis of domain structures. These are: crystal anisotropy; Bloch wall; action of magnetic field; surface charge of magnetization; and strain anisotropy. Domain rotation, domain geometry in low and medium fields, and domain wall displacements. Curves for various magnetic properties of a 3.8%-Si iron and of an 89%-Ni Permalloy. Powder patterns of areas subjected to mechanical and electrolytic polishing. 14 ref.
- 3A-171. A Quantitative Examination of Recent Ideas on Domain Structure.** (In English.) L. F. Bates and F. E. Neale. *Physica*, v. 15, Apr. 1949, p. 220-224.  
Some experimental results obtained during a study of Bitter figures. A thin strip of 2.8%-Si iron was used. Variation of the width of a domain pair with applied field. Line deposits produced by a magnetic-powder technique.
- 3A-172. Nouvelle théorie du champ coercitif.** (A New Theory of the Coercive Field.) Louis Néel. *Physica*, v. 15, Apr. 1949, p. 225-233; discussion p. 233-234.  
Attributes coercive field to the influence of fields of dispersion due to nonuniformity of spontaneous magnetization resulting from the presence of vacancies or of inclusions, or to the influence of specific directions of magnetization produced by internal tensions. Mathematical elaboration of the proposed theory.
- 3A-173. The Cause of Anisotropy in Permanent Magnet Alloys.** (In English.) K. Hoselitz and M. McCaig. *Physica*, v. 15, Apr. 1949, p. 241-243.  
Previously abstracted from *Proceedings of the Physical Society*, item 3A-83, 1949.
- 3A-174. Time-Effects in Ferromagnetism.** (In English.) J. L. Snoek. *Physica*, v. 15, Apr. 1949, p. 244-251.  
Attempts systematic survey of the phenomena dividing them into ionic and electronic time-effects.
- 3A-175. On the Theory of Ferromagnetic Resonance.** (In English.) D. Polder. *Physica*, v. 15, Apr. 1949, p. 253-255.  
Mathematical analysis.
- 3A-176. On the Gorter Normal Field Ferromagnetic Resonance Experiment.** (In English.) C. Kittel, W. A. Yager, and F. R. Merritt. *Physica*, v. 15, Apr. 1949, p. 256-257.  
Gorter suggested in 1947 that it would be of interest to carry out the ferromagnetic-resonance experiment with the static magnetic field normal to the plane of the specimen. Such an experiment was performed at a frequency of 23,970 mc. per sec. using an annealed Superalloy specimen.
- 3A-177. Ferromagnetic Resonance in Crystal Fields.** (In English.) R. Kronig. *Physica*, v. 15, Apr. 1949, p. 264-265.  
Interprets results of A. Wieberdink (*Nature*, v. 162, 1948, p. 527) with respect to difference of wave length on lines with a Cu and an Fe-Ni central wire, respectively.
- 3A-178. Frottement intérieur par ferromagnétisme.** (Internal Friction Caused by Ferromagnetism.) Ch. Boulanger. *Physica*, v. 15, Apr. 1949, p. 266-271.  
The above was investigated for Armco iron, nickel, ferromagnetic metals, Ni-Cr-Mo steel, and a hypereutectoid steel. Method of investigation and results.
- 3A-179. Displacement of the Curie Point of Ferromagnetic Alloys under the Influence of Tensile Stress.** (In Russian.) K. P. Belov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics) v. 19, Apr. 1949, p. 346-352.  
Investigated for Fe-Ni, Fe-Pt, Fe-Ni-Cr, and Fe-Ni-Co. The earth's magnetism could not be explained by the "ferromagnetism" of the earth's core, because Fe, Ni, and Fe-Ni alloys should undergo a decrease of Curie point under high pressures. 11 ref.
- 3A-180. Character of Curves of Composition Vs. Properties of Metallurgical Solid Solutions at High Temperatures.** (In Russian.) A. M. Borzdyka. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 1, 1949, p. 505-507.  
Investigated by the analysis of isotherms of specific electrical resistance (0-1000° C.) of the Fe-Ni and Fe-Cr-Ni systems. Results indicate that the "classical" scheme for the variation of the properties of solid solutions with composition is valid only in the range from room up to moderately high temperatures.
- 3A-181. Relationship Between Elongation and Shear Under Different Types of Deformation.** (In Russian.) V. G. Osipov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 580-582; discussion p. 583.  
Mathematical relationship proposed by Davidenkov for values of elongation and shear, under different types of elongation. A slight error in derivation of the formula is indicated. Discussion consists of a clarification by Davidenkov.
- 3A-182. Relation Between Residual Strain Energy and Elastic Moduli.** (In English.) Clarence Zener. *Acta Crystallographica*, v. 2, June 1949, p. 163-166.  
Presence of residual strain energy necessarily results in a lowering of the over-all tensile and shear moduli. A quantitative relation is derived between density of residual strain energy and decrease in tensile and shear moduli. Interprets recent observations of Köster that solute atoms of only a small solubility lower the tensile modulus when they are atomically dispersed.
- 3A-183. Interchange Interaction and Collective Electron Ferromagnetism.** E. P. Wohlfarth. *Philosophical Magazine*, ser. 7, v. 40, July 1949, p. 703-717.  
Theoretical mathematical discussion of the relationship between electron interchange interaction and the ferromagnetic properties of metals. 17 ref.
- 3A-184. Graphical Analysis of Impact of Bars Stressed Above the Elastic Range. Parts I and II.** Kalman J. DeJuhasz. *Journal of the Franklin Institute*, v. 248, July 1949, p. 15-48; Aug. 1949, p. 113-142.  
The history and gradient of stress and of velocity are represented in three-dimensional diagrams. Energy expended in impact, and its distribution into energy of plastic deformation, and into residual kinetic and elastic stress energy, as well as total residual permanent strain are determined. Numerical examples. Part II deals with impact in the stress range above the elastic limit and includes 43 abstracts from the literature.
- 3A-185. The Phenomenon of Anisotropy in Annealed Polycrystalline Metals.** A. Krupkowski and S. Kawinski. *Journal of the Institute of Metals*, v. 75, July 1949, p. 869-880.  
The conception of coefficients of partial uniform elongation is introduced, the value of which may be easily calculated from elongation measurement on a fractured flat metal testpiece. Relationship of these coefficients is the coefficient of anisotropy for polycrystalline metals. Some annealed metals, such as mild steel, brass, and aluminum, after a previous cold working, show a distinct tendency toward anisotropy.
- 3A-186. Strength of Alloys at High Temperature.** K. A. Osipov. *Metal Progress*, v. 56, Aug. 1949, p. 262, 266, 268, 270, 272.  
Based on three papers in *Doklady Akademii Nauk SSSR*. See items 3A-113 and 3A-114, 1948; 3A-29, 1949.
- 3A-187. Contribution à l'étude du frottement intérieur.** (Contribution to the Study of Internal Friction.) Christian Boulanger. *Revue de Métallurgie*, v. 46, Apr. 1949, p. 255-265.  
Extensive review of the literature. Experimental work done to be described in subsequent installments. (To be continued.)
- 3A-188. Die Schadenslinie bei Dauerstandsbeanspruchung.** (The Damage Range in Creep Stressing.) August Thum and Kurt Richard. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 229-242.  
Fracture is initiated by very small but gradually increasing damages to

### 3B—Ferrous

the structure of the metal, which can partly be corrected by heat treating. A distinction is made between micro and macro-damages. Effects of chemical composition, heat treatment, testing temperature, and passage of time on distortion caused by slip or plastic deformation. Practical suggestions for periodic inspection of large structures for avoidance of failure. 37 ref.

**3A-189. High Temperature Characteristics of Heat Resistant Alloys.** Norman S. Mott. *Product Engineering*, v. 20, Sept. 1949, p. 163.  
Data sheet.

**3A-190. Fatigue.** P. S. Wakefield. *Machinery Lloyd* (Overseas Edition), v. 21, Aug. 13, 1949, p. 68-72.

General discussion of fatigue especially as applied to metallic materials of construction. Diagrams illustrate the four types of stress cycles most frequently encountered. Effects of notches and other stress raisers, and of corrosion.

**3A-191. The Effect of Impurities on the Properties of Metals.** C. H. Desch. *Bulletin of the Institution of Mining and Metallurgy*, Aug. 1949, p. 17-28; discussion, p. 28-30.

Also methods for removal of impurities from various metals.

**3A-192. Brinell Hardness as a Function of the Parameters of Plasticity of Metals.** (In Russian.) G. P. Zaitsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 704-717.

The relation between constants specific for ball impression and the corresponding constants under tensile stress, i. e., yield strength and elongation, were theoretically investigated. Brinell hardness and conditional stress were also found to be interrelated. Equations of dependence are derived on the basis of theoretical considerations. Experimental and theoretical data.

**3A-193. Contribution à l'étude du frottement intérieur.** (Contribution to the Study of Internal Friction.) Christian Boulanger. *Revue de Métallurgie*, v. 46, May 1949, p. 321-342.

Concludes extensive descriptive review of the literature, including experimental methods and apparatus and reproduction of the more important experimental results. 156 ref.

**3A-194. Intérêt des mesures magnétiques dans la détermination de la constitution des alliages dia et paramagnétiques.** (Importance of Magnetic Measurements in Determination of the Constituents of Diamagnetic and Paramagnetic Alloys.) F. Mahn. *Revue de Métallurgie*, v. 46, June 1949, p. 363-364; discussion, p. 364.

Variation of coefficient of magnetization with composition was investigated. It was found that the coefficient does not depend on the temperature in the case of diamagnetic alloys. However, for paramagnetic alloys the coefficient is dependent on temperature and on Curie point, in accordance with Weiss's law. 14 ref.

**3A-195. Fortschritte auf dem Gebiet der magnetischen Werkstoffe.** (Advances in the Field of Magnetic Materials.) Franz Pawlek. *Metall*, July 1949, p. 211-215.

Reviews literature published since 1937. 65 ref.

**3A-196. Stress-Strain Relations.** J. H. Palm. *Metal Progress*, v. 56, Sept. 1949, p. 358.

Reply to M. G. Corson's abstract and criticism of the author's paper on "Stress-Strain Relations for Uni-Axial Loading".

**3B-171. Effect of Carbon and Nitrogen on Temper Brittleness.** D. C. Buffum, L. D. Jaffe, and W. F. Clancy. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 499-500.

Results of experiments on an iron alloy containing very little C or N indicate that temper brittleness cannot develop in their absence. However, two alternative explanations are possible.

**3B-172. Deoxidation, Refining Processes Found to Affect Creep-To-Rupture Tests.** G. V. Smith and E. J. Dulis. *Steel*, v. 126, Aug. 22, 1949, p. 98.

Previously abstracted from *American Society for Testing Materials*, Preprint 18, item 3B-119, 1949.

**3B-173. Behaviour of Cast Steel at Elevated Temperatures.** A. E. Johnson. *Engineer*, v. 188, July 29, 1949, p. 126-128; Aug. 5, 1949, p. 138-141; Aug. 12, 1949, p. 165-168; Aug. 19, 1949, p. 189-191, 193. From British Electrical and Allied Industries Research Association, Report J/T 137, "The Behaviour of a Nominally Isotropic 0.17% C Cast Steel Under Combined Stress Systems at Elevated Temperatures".

About 80 tests consisting of pure tensile, pure torsion and complex stress-creep tests (the latter under various combinations of simple tensile and torsion stresses) at 350, 450, and 550° C. Extensive mathematical analysis.

**3B-174. The Physics of Sheet Steel. 25. The Problem of Cyclic Magnetisation.** (Continued.) G. C. Richer. *Sheet Metal Industries*, v. 26, July 1949, p. 1421-1426, 1436; Aug. 1949, p. 1661-1666.

Only installment deals with cyclic domain structure. Aug. installment surveys problems in the measurement of ferromagnetic properties. 16 ref. (To be continued.)

**3B-175. Fundamental Effects of Aging on Creep Properties of Solution-Treated Low-Carbon N-155 Alloy.** D. N. Frey, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics*, Technical Note 1940. Aug. 1949. 71 pages.

Experimental procedure for establishing the fundamental mechanisms by which processing, heat treatment, and chemical composition control the properties of alloys at high temperature. The method relates microstructures and X-ray diffraction characteristics to creep and rupture test properties. Results of application to the above alloy and correlation with short-time creep and rupture characteristics at 1200° F.

**3B-176. L'acier à 8-9% de Nickel: caractéristiques mécaniques aux basses températures; résistance à la corrosion.** (Steel Containing 8-9% Nickel: Mechanical Properties at Low Temperatures; Corrosion Resistance.) P. Fiel. *Métaux et Corrosion*, v. 24, Apr. 1949, p. 118. From *Revue du Nickel*, no. 2, 1949, p. 32.

Properties at temperatures as low as -200° C. Composition, optimum heat treatment, and mechanical properties are indicated in tabular form.

**3B-177. Contribution à l'étude de l'influence des inclusions non métalliques sur la qualité des aciers.** (Contribution to the Study of the Influence of Non-metallic Inclusions on the Quality of Steels.) F. Eugène. *Revue de Métallurgie*, v. 46, Apr. 1949, p. 193-209.

Use of the Fremont etchant (10 g. of iodine and 20 g. of KI in 100 cc. of water). Application of this reagent to systematic control of the finishing of castings and forgings. Influence of inclusions on mechanical and physical properties. A statistical study of the relationship between the purity of a steel and its mechanical properties.

**3B-178. Das Festigkeitsverhalten niedriglegierter warmfester Stähle und ihre Neigung zu verformungslosen Brüchen.** (The Strength Behavior of Low-Alloy Heat Resistant Steels and Their Tendency to Brittle Fracture.) K. Richard. *Archiv für Metallkunde*, v. 3, May 1949, p. 157-164.

Critically examines the customary methods of testing fatigue-stressed heat resistant steels. Causes and remedies for brittle fracture as well as their relationship to other properties of steels. The need for long-time testing is stressed. 22 ref.

**3B-179. Kluzne vlastnosti litiny na loziskova pouzdra.** (Sliding Characteristics of Cast Iron as a Bearing Material.) Josef Doskar. *Hutnické Listy*, v. 4, Jan. 1949, p. 6-10; Feb. 1949, p. 45-48; Apr. 1949, p. 112-115.

Effect of composition, structure, and alloying elements on wear and mechanical properties of cast iron. For smooth running under small pressures, no differences could be found for different carbon contents. Copper and aluminum additions improve sliding characteristics, at the expense of mechanical and dynamical properties.

**3B-180. Residual Stresses in Fe-Ni Alloys Partly Transformed from  $\gamma$  to  $\alpha$ .** (In Japanese.) Tadao Sano. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 19-22.

Residual stresses in alloys containing about 30% Ni were determined. The partial transformation was effected by immersion in various baths below 0° C. Results are summarized in English.

**3B-181. Some Experimental Results for Notched and Bored Bars Under Repeated Loading. III. Effect of Surface Finishing Upon Fatigue Strength. IV. Relationship Between Diameter of Holes Perpendicular to the Axis of Bars and Their Fatigue Limit.** (In Japanese.) Yuichi Kawada. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 33-35.

Part III: fatigue tests were made on 12 kinds of variously finished surfaces on Si-Mn-Cr steel with a tensile strength of 100 kg. per sq. mm. Results are summarized in English. Part IV: the relationship indicated above was investigated for Ni-Cr steel under repeated bending and torsion. It was found that quantitative recovery of fatigue limit is due to compression of the edge of the hole by the steel ball.

**3B-182. Investigation of Timepiece Springs. I.** (In Japanese.) S. Koshiba and K. Nobara. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 43-49.

Two kinds of 1% C steel were studied, one made from a magnetic ore and the other from scrap iron. Comparative mechanical properties and effects of cold rolling and heat treatment variables.

**3B-183. Dynamic Vs. Static Properties of Low-Alloy Cast Steels.** W. K. Bock. *Foundry*, v. 77, Sept. 1949, p. 72-74, 214-216, 219.

Results of investigation of 24 heats. Impact value, irrespective of composition, is related to both tensile strength and reduction of area. In quenched steels, the relation is close enough that there are no great differences of impact strength for given static properties. 15 ref.

**3B-184. Progress Reports of Investigation of Railroad Rails, Joint Bars, and Manganese Steel Casting.** R. E. Cramer and R. S. Jensen. Engineering Experiment Station, University of Illinois, Reprint Series No. 43 (*Bulletin*, v. 47, no. 1), Aug. 1949, 42 pages.

Previously abstracted from Ameri-

can Railway Engineering Association, *Bulletin*. See items 3B-29, 3B-32, 3B-34, 3B-36, and 22B-79, 1949.

**3B-185.** Beitrag zur Kenntnis der aluminiumlegierten Gusseisen. (Contribution to Knowledge Concerning Aluminum-Containing Cast Iron.) Heinz W. Uhlitzsch and Alfred Keller. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Aug. 1949, p. 227-232.

Surveys the literature. Effect of Al on graphite content, mechanical properties, machinability, growth, and heat resistance of cast irons. A cast iron with more than 2.5% Si and 8% Al has good machining properties and high resistance to scaling at elevated temperatures. 26 ref.

**3B-186.** Effect of Sulphur on Quality and End Uses of Steel Products. M. Tenenbaum. *Blast Furnace and Steel Plant*, v. 37, July 1949, p. 802-806; *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 98-99.

Previously abstracted from *American Iron and Steel Institute Preprint*. See item 3B-101, 1949.

**3B-187.** The Yielding and Strain-Aging of Carburized and Nitrided Single Crystals of Iron. Harry Schwartzbart. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 637-645.

Mechanisms of the phenomena were studied using single crystals of iron annealed in wet hydrogen to remove the carbon and nitrogen. These were cut into two specimens having the same orientation with respect to the tension axis. Results indicate that yield point in polycrystalline iron is not due to the presence of a grain-boundary film as has been frequently suggested. 19 ref.

**3B-188.** Selection of Steel for Automobile Parts. What Engineers Should Know Today About Hardenability Band Steels. Part II. Significance of Hardness. A. L. Boegehold. *SAE Journal*, v. 57, Sept. 1949, p. 25-28.

Graphs show approximate relationship of hardness to tensile strength. Hardness limits for important car components are superimposed on these graphs. Another graph shows relationship of strength of steel and service stress that can be imposed without premature failure. (To be continued.)

**3B-189.** "E" Steel. *Screw Machine Engineering*, v. 10, Sept. 1949, p. 40.

Faster, free-machining screw stock developed by Jones & Laughlin to step up production.

**3B-190.** Phénomène de Portevin-Le Chatelier dans les aciers doux et sa relation avec le vieillissement d'une éprouvette écrouie. (Phenomenon of Portevin-Le Chatelier in Soft Steels and Its Relation to Aging of Strain-Hardened Test Specimens.) Christian Boulanger. *Comptes Rendus (France)*, v. 228, June 27, 1949, p. 2026-2028.

The phenomenon consists of the appearance of discontinuities on the stress-elongation curve due to the release of plastic deformation waves—associated with the property of blue brittleness. It was investigated for very soft steel wires (0.04% C). Kinetics and relation to aging are shown graphically.

**3B-191.** Endurance Limit of Steel Under Simultaneous Action of Constant and Alternating Stresses. (In Russian.) G. V. Uzhik. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), May 1949, p. 657-665.

Investigated for two low-alloy steels. Diagrams for determination of endurance limits over a wide range of constant and alternating stresses acting simultaneously are proposed. Notch sensitivities were established at different points in the

stress cycle. Relation between effective concentration of stress and notch sensitivity.

**3B-192.** Schwingungsuntersuchungen an hartverchromten Stäben. (Fatigue Tests on Hard-Chromium Plated Bars.) Walter Ellender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberfläche*, v. 3, sec. A, Aug. 1949, p. A161-A163.

Tests show that reduction in the fatigue strength of bars is not caused by the hard-chromium plating itself, but by the fact that cracks in the plating roughen the surface of the plated material and thus cause a notch effect.

**3B-193.** Die Stahlauswahl für Tiefziehbleche. (The Selection of Steel for Deep-Drawing Sheets.) F. Eisenkolb. *Archiv für Metallkunde*, v. 2, no. 7, 1948, p. 217-223.

Properties and methods of producing sheet steel suitable for deep drawing.

### 3C—Nonferrous

**3C-151.** Deformability of Copper-Nickel Alloys. (In Russian.) S. I. Gubkin and V. A. Golovin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences) Mar. 1949, p. 421-425.

The deformability of nickel, Monel metal, German silver, and argentan (a Cu-Ni-Zn alloy). Comparative evaluation of these alloys with respect to their capacity for changing shape under compression. Experimental data fully confirm the theoretical assumptions.

**3C-152.** Variation of Superconductive Properties of Tantalum During Its Saturation by Hydrogen. (In Russian.) V. R. Golil, B. G. Lazarev, and V. O. Khotkevich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Mar. 1949, p. 202-206.

It was proven that, during saturation of Ta by H<sub>2</sub>, its temperature and magnetic-transition intervals widen markedly. In the case of high saturation, superconductivity is not observed below 1.85° K.

**3C-153.** Mechanical Properties of a Silver-Copper Alloy (7-8% Cu) Under Tensile Stress. (In Russian.) G. N. Kolesnikov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 347-354.

Tensile strength diagrams from 20 to 100° C. were obtained in the hardened and aged conditions. Existence of "low-temperature" and "high-temperature" types of tensile-strength diagrams. Tensile-strength diagrams for the hardened condition are shown to have "saw-tooth" shape at temperatures of 150° C. and above. For both types of stress, dependence of resistance to deformation, yield strength, and elongation on temperature are indicated.

**3C-154.** Titanium-Chromium Alloys. D. G. McPherson and M. G. Fontana. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 12-17.

See abstract from *Metal Progress*, item 3C-62, 1949.

**3C-155.** Physical and Mechanical Properties of Commercially Pure Titanium. C. I. Bradford, J. P. Catlin, and E. L. Wemple. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 49-58; discussion p. 58-59.

See abstract from *Metal Progress*, item 3C-56, 1949.

**3C-156.** Properties of Iodide Type Titanium. F. B. Litton. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 70-71; discussion p. 72.

See abstract from *Metal Progress*, item 3C-55, 1949.

**3C-157.** Some Preliminary Test to Determine Applications for Titanium. W. Lee Williams. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 92-103; discussion p. 103-104.

See abstract from *Metal Progress*, item 3C-57, 1949.

**3C-158.** Some Preliminary Data on Alloys of Titanium. E. I. Larsen, E. F. Swazy, L. S. Busch, and R. H. Freyer. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 105-124; discussion p. 124.

See abstract from *Metal Progress*, item 3C-60, 1949.

**3C-159.** Titanium-Base Alloys. Howard C. Cross. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 125-131.

See abstract from *Metal Progress*, item 3C-59, 1949.

**3C-160.** Some Aspects of the Metallurgy of Titanium Alloys. P. H. Brace. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 132-142; discussion p. 142-143.

See abstracts from *Metal Progress*, items 2D-11 and 3C-61, 1949.

**3C-161.** Relationship of the Critical Temperature of Superconducting Alloys to its Pressure. (In Russian.) W. E. Alekseevskii. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Apr. 1949, p. 358-360.

Investigated for Bi<sub>2</sub>Ni, Sn, and Bi<sub>2</sub>Rh at pressures of 400-900 mm. Hg and 3.6-4.4° K. The displacement of critical temperature is toward lower temperatures in the case of Sn and higher temperatures in the cases of Bi<sub>2</sub>Ni and Bi<sub>2</sub>Rh. Method of testing.

**3C-162.** The High Frequency Resistance of Superconductors. (In English.) A. B. Pippard. *Physica*, v. 15, Apr. 1949, p. 40-44.

Theoretical implications of results obtained at two frequencies, 1200 and 9200 megacycles per sec. The work at the higher frequency still continues, fairly complete data having been obtained for tin, and less complete data for mercury.

**3C-163.** Measurements on the Electrical Resistivity of Thin Metallic Films. (In English.) A. Van Itterbeek and L. De Greve. *Physica*, v. 15, Apr. 1949, p. 80-82.

Results for nickel films produced by cathodic sputtering and vacuum deposition. The two pieces of apparatus.

**3C-164.** Mechanical Properties of Some Copper-Base Alloy Castings. F. C. Evans, W. A. Baker, G. T. Callis, and F. Hudson. *Foundry Trade Journal*, v. 87, July 7, 1949, p. 9-18; July 14, 1949, p. 39-44; July 21, 1949, p. 73-77.

Results of an investigation. Data are presented in a series of photographs or drawings which give the casting records with a table for each, summarizing properties determined in each of 25 cases in five groups: phosphor bronze, sand cast and chill cast (July 7 issue); lead-free and leaded gunmetals (July 14 issue); aluminum bronze and high-tensile brasses (July 21 issue).

**3C-165.** Some Anisotropic Properties of Gallium. R. W. Powell. *Nature*, v. 164, July 23, 1949, p. 153-154.

Results of some electrical resistivity measurements, showing a maximum-minimum ratio of 7 with axial direction. Comparative data from the literature for Sb, Bi, Cd, Hg, Te, Sn, and Zn show much smaller values of this ratio, ranging from 1.04 for Zn to 2.75 for Te. 10 ref.

**3C-166.** Rhodium, A Precious Metal of Many Uses. *Journal of Chemical Edu-*

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cation, v. 26, Aug. 1949, p. 442-443. Reprinted from *Inco*, v. 22, Fall 1948. Properties and applications.

**3C-167. The Conductivity of Silicon and Germanium as Affected by Chemically Introduced Impurities.** G. L. Pearson. *Electrical Engineering*, v. 68, Aug. 1949, p. 685-686.

Effects of minute amounts of B, P, and Sb. The amounts (for instance, one atom of B per million of Si) can only be detected by use of radioactive tracers and the Hall effect.

**3C-168. The Work Function of Copper.** Paul A. Anderson. *Physical Review*, ser. 2, v. 76, Aug. 1, 1949, p. 388-390.

Work functions and aging characteristics of 14 Cu surfaces were determined by measurement of their contact differences of potential with respect to barium reference surfaces of known work function. Measurement was by the retarding-potential method in tubes sealed from the pumps and gettered with vaporized barium. The Cu surfaces were prepared by subjecting "spectroscopic standard" copper to 40 vacuum fusions followed by fractional distillation, redistillation of the fractions, and condensation of the vapor on glass. The barium films were prepared by a similar, standardized technique.

**3C-169. Magnetic Susceptibility of Zinc at Liquid Hydrogen Temperatures.** Jules A. Marcus. *Physical Review*, ser. 2, v. 76, Aug. 1, 1949, p. 413-416.

Investigated in fields of 3-10.5 kilogauss. Measurements were made on single and polycrystalline specimens by the Faraday method. Results are compared with those for bismuth. 16 ref.

**3C-170. Variation du champ coercitif du nickel réduit entre -253° C et 150° C.** (Variation of the Coercive Force of Nickel Reduced Between -253 and 150° C.) *Comptes Rendus*, v. 228, May 16, 1949, p. 1581-1582. Results of experimental determination.

**3C-171. The Subcooling of Liquid Metals.** D. Turnbull. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 817.

Experimental data on Hg and Ga droplets.

**3C-172. Magnetic Properties of Metal Single Crystals at Low Temperatures.** D. Shoenberg. *Nature*, v. 164, Aug. 6, 1949, p. 225-226.

In preliminary experiments on the magnetic anisotropy of single crystals, measured by a couple acting in a uniform magnetic field, the de Haas-van Alphen effect was found in Ga and Sn while negative results were obtained for Sb, In, Pb, and Hg in fields up to 9500 gauss and at temperatures down to 1.4° K. Some typical curves illustrate the behavior of Ga and Sn.

**3C-173. The Variation of the Adiabatic Elastic Constants of KCl, NaCl, CuZn, Cu, and Al With Pressure to 10,000 Bars.** David Lazarus. *Physical Review*, ser. 2, v. 76, Aug. 15, 1949, p. 545-553.

Measurements of elastic constants of single-crystal specimens of Cu, Al, CuZn, KCl, and NaCl subject to hydrostatic pressures up to about 10,000 kg. per sq. cm.

**3C-174. Der Elastizitätsmodul und die Festigkeit von Hartchromschichten.** (The Modulus of Elasticity and Strength of Hard Chromium Coatings.) Walter Ellender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberfläche*, v. 3, sec. A, July 1949, p. A145-A147.

Experiments made to determine the above from the results of tensile and bending tests. Heating to 300° C. reduces the modulus of elasticity from 16,400 to about 13,000 kg. per sq. mm. The tensile strength of hard chromium was found to be 15 kg. per

sq. mm., but its yield point could not be determined.

**3C-175. Matériaux pour résistances électriques et éléments de chauffage.** 2. Résistance de chauffage... Elektrische Widerstandsmaterialien und Heizleiter. 2. Heizleiter. (Electrical Resistance Materials and Heating Elements. 2. Heating Elements.) Th. Zürer and H. Boret. *Pro-Metal*, v. 2, June 1949, p. 389-395.

Properties and specific uses of Ni-Cr, Ni-Cr-Fe, Al-Cr-Fe, and Si-Cr-Fe alloys as heating elements. Constitution diagrams of Fe-Cr and Ni-Cr alloys.

**3C-176. Magnetostriction of Fe-Pt Alloys.** (In Russian.) N. S. Akulov, Z. I. Alizade, and K. P. Belov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 21, 1949, p. 815-818. Investigated for alloys containing 54, 56, and 58% Pt. The influence of heat treatment.

**3C-177. Über den hochduktilen Zustand von Legierungen auf Al-Zn-Basis.** (The Highly Ductile State of Al-Zn Base Alloys.) F. Sauerwald. *Archiv für Metallkunde*, v. 3, May 1949, p. 165-173.

The high ductility of Al-Zn alloys and methods of improving this property by suitable melting methods, heat treatments, forging, and alloying additions. Other mechanical and chemical properties of this type of alloy.

**3C-178. Temperature Dependence of Susceptibility of Zinc, Cadmium, and Gamma-Brass.** Jules A. Marcus. *Physical Review*, ser. 2, v. 76, Sept. 1, 1949, p. 621-623.

Temperature dependence (14-373° K.) of diamagnetic susceptibility of Zn and Cd single crystals and several polycrystalline gamma-brasses. 14 ref.

**3C-179. Effect of Impurities on the Electrical Properties of Selenium.** N. A. Penin and K. V. Astahov. *Engineering & Chemical Digest*, v. 1, July, 1949, p. 27-30. Translated from *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 15, no. 2, 1945. Experimental work.

**3C-180. Specific Heat of Sodium Between 0° and 900° C., the Melting Point and Heat of Fusion.** D. C. Ginnings, T. B. Douglas, and Anne F. Ball. *U. S. Atomic Energy Commission, AEC-D-2639*, July 6, 1949, 21 pages. 16 references.

**3C-181. Law of Convergence to the Saturation Point in Polycrystalline Nickel.** (In Russian.) N. S. Akulov and N. Z. Miryasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 29-32.

Method of computation of coefficients in a formula proposed for the determination of differential sensitivity in polycrystalline ferromagnetics, free of residual stresses. Calculated coefficients for different values of the variables correspond closely to experimental data. 11 ref.

**3C-182. Propriétés magnétiques des alliages cérium-magnésium.** (Magnetic Properties of Cerium-Magnesium Alloys.) F. Mahn. *Revue de Métallurgie*, v. 46, June 1949, p. 365-369; discussion, p. 370.

Experimental results indicate that all CeMg alloys possess paramagnetic properties in accordance with Weiss's law. These properties are used to determine the equilibrium diagram of the binary system and the presence of certain intermetallic compounds. 10 ref.

**3C-183. Über die elektrischen Eigenschaften des Thoriums.** (Concerning the Electrical Properties of Thorium.) Dietrich Bender. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 257-260.

The effect of temperature on the

electrical resistance of thorium was measured in order to determine whether it—like other elements in its group—has allotropic modifications. Data indicate no allotropic transformation up to 1100° C. 16 ref.

**3C-184. Some New Data on the Properties of Wrought Titanium.** F. B. Fuller. *Metal Progress*, v. 56, Sept. 1949, p. 348-350.

Various mechanical properties for annealed and cold rolled conditions.

**3C-185. Some Properties of Uranium.** A. R. Kaufmann. *Metal Progress*, v. 56, Sept. 1949, p. 386, 390, 392, 399.

See abstract from "The Science and Engineering of Nuclear Power. Vol. II", item 25A-65, 1949.

**3C-186. Rectangular Hysteresis Loops of Co-Ni-Fe Alloys.** R. A. Chegwidden. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 570.

Shown graphically for two "Perminvars"—43% Ni, 34% Fe, and 23% Co; and 34% Ni, 34% Fe, 29% Co, and 3% Mo—both heat treated in a magnetic field.

**3C-187. The Effect of Oxygen, Nitrogen, and Hydrogen on Iodide Refined Titanium.** Robert I. Jaffee. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 646-654.

Effects of 0.25, 0.5, and 1.0 atomic % additions of each of the above gases on density, electrical resistivity, microstructure, mechanical properties, cold rolling characteristics, and work hardenability were determined. Apparatus and procedure for addition of the gases.

**3C-188. Effets réversibles de l'adsorption des gaz sur la conductibilité électrique des couches métalliques très minces.** (Reversible Effects of Gas Adsorption on the Electrical Conductivity of Very Thin Metallic Films.) Nicolas Mostovetch. *Comptes Rendus* (France), v. 228, May 30, 1949, p. 1702-1704.

A study of adsorption of air, N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>, and CO<sub>2</sub> on Mo, Pt, Rh, Ni, and Au. Resistance of deposits having a negative temperature coefficient decreases on adsorption of gas and increases reversibly on liberation of adsorbed gas. The reverse is true for deposits having a positive temperature coefficient of resistance. Results contribute to a better understanding of the structure of thin films and of the mechanism of their electrical conduction.

**3C-189. Effets irréversibles des gaz sur la conductibilité électrique des couches métalliques très minces.** (Irreversible Effects of Gas on the Electrical Conductivity of Very Thin Metallic Films.) Nicolas Mostovetch. *Comptes Rendus* (France), v. 228, June 13, 1949, p. 1850-1852.

Irreversible effects at pressures of 10<sup>-4</sup> mm. Hg. Results for Mo, Au, Pt, Ta, and W in atmospheres of N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>, CO<sub>2</sub>, and He. Data for Mo and Pt, over a wide range of temperatures and pressures, are shown graphically.

### 3D—Light Metals

**3D-56. Magnesium Alloys and Applications.** John C. McDonald. *ASTM Bulletin*, July 1949, p. 67-69. Properties and applications.

**3D-57. Creep Strength of Some Magnesium Alloys.** G. A. Mellor and R. W. Ridley. *Engineering*, v. 168, July 29, 1949, p. 120.

Previously abstracted from *Journal of the Institute of Metals*, item 3D-44, 1949.

**3D-58. Analysis of the Temperature Coefficient of Shear Modulus of Aluminum.** Ting-Sui Ké. *Physical Review*, ser. 2, v. 76, Aug. 15, 1949, p. 579.

The shear modulus of a specimen

of cubic symmetry may be regarded as an implicit function of temperature (through its volume) and as an explicit function. It thus consists of two terms. The contribution of each term is estimated for an Al crystal which is fairly isotropic.

**3D-59. Die latente Verfestigung in gedehnten Aluminiumkristallen.** (The Latent Strength Increase in Elongated Aluminum Crystals.) Fritz Röhm and Albert Kochendörfer. *Zeitschrift für Naturforschung*, v. 3a, Dec. 1948, p. 648-656.

Experiments were made to determine the effect of stressing. Results show that the strength increase is primarily a function of the angle of inclination of the slip planes to the direction of tensile stress.

**3D-60. Die Wärmebeständigkeit der Leichtmetalle.** (The Heat-Resistance of the Light Metals.) A. Schimmel. *Archiv für Metallkunde*, v. 3, June 1949, p. 212-213.

The properties and treatment of heat resistant Al alloys and methods of testing their strength properties at elevated temperatures.

**3D-61. Boron Hardening of Steel. Nature of Action in Various Alloys.** *Chemical Age*, v. 61, Aug. 6, 1949, p. 195-196.

Methods for testing and limiting factors. Based on research of the U. S. Bureau of Standards.

**3D-62. Factors Controlling the Hot-Tearing of Aluminium Casting Alloys.** D. C. G. Lees. *Foundry Trade Journal*, v. 87, Aug. 18, 1949, p. 211-218, 220.

11 ref. Previously abstracted from *Metal Industry*. See item 3D-53, 1949.

**3D-63. Magnesium-Zirconium Alloys; Mechanical Properties at Elevated Temperatures.** C. J. P. Ball. *Metal Industry*, v. 75, Aug. 19, 1949, p. 152-153.

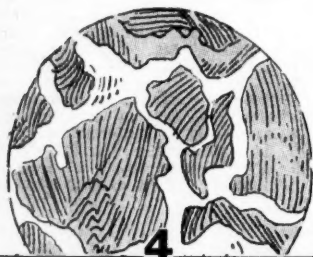
Compositions, physical properties, and methods of working.

**3D-64. Stress-Strain Relations in the Plastic Range for Biaxial Stresses.** Joseph Marin. *Journal of the Franklin Institute*, v. 248, Sept. 1949, p. 231-249.

See abstract from *National Advisory Committee for Aeronautics*, Technical Note No. 1889, item 3D-35, 1949.

For additional annotations indexed in other sections, see:

5B-22; 5C-16; 11-259; 14C-70-75; 18B-163; 18C-10; 18D-12; 19C-23; 23C-54; 24B-41; 25D-31



## CONSTITUTION and STRUCTURE

### 4A—General

**4A-80. Les lois cinétiques de l'adsorption dans le cas particulier de la pénétration superficielle.** (Kinetic Laws of Adsorption in the Special Case of Superficial Penetration.) Keith J. Laidler. *Bulletin de la Société Chimique de France*, Mar.-Apr. 1949, p. D171-D176.

An equation approximating the rate of adsorption and indicates the

conditions under which each of two mechanisms determines this rate. The theory is applied to the adsorption of hydrogen by metals and to the formation of oxide films. 22 ref.

**4A-81. Theory of Stability of Binary Lattices.** (In Russian.) V. A. Zhdanov and N. L. Vishnevskaya. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Mar. 1949, p. 231-234.

The stability of the binary volume-centered lattice. It is shown that, during transition from a monatomic lattice, unstable because of the absence of shear resistance, to a binary lattice, high resistance to shear appears even at very small differences of atomic dimensions.

**4A-82. Deformation of the Crystalline Lattice of a Metal Near the Surface.** (In Russian.) S. Glauberman. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Apr. 1949, p. 300-303.

Formula for relative displacements of ionic networks of the crystalline lattice of a metal having a face-centered structure in a direction perpendicular to the boundary surface on the basis of a simplified theory of the average density of the electron gas in each elementary nucleus of a metallic crystal. Also derives an expression for the additional potential developed in the metal in connection with the presence of a boundary surface.

**4A-83. Phenomenon of Cleavage.** (In Russian.) A. V. Stepsnov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 492-506.

Presents detailed theoretical study, considering that this property is universal and is present in all types of crystals including those of metals, minerals, salts and even organic compounds. Data of investigation indicate that anisotropy of elastic properties is necessary for cleavage. 12 ref.

**4A-84. Structural and Elastic Properties of Metals.** (In English.) H. Jones. *Physica*, v. 15, Apr. 1949, p. 13-22; discussion p. 21-22.

Properties at low temperatures depend only on the energy of the structure and the way it changes as the crystal is subjected to homogeneous strains. In the theory of Bloch, Wigner, and Seitz, the energy is regarded as a sum of terms which, to a useful approximation, can be calculated separately. Effect of these various contributions in determining the structural type, and particularly the values of the elastic constants of the metals and alloys for which measurements are available.

**4A-85. The Resonating-Valence-Bond Theory of Metals.** (In English.) Linus Pauling. *Physica*, v. 15, Apr. 1949, p. 23-28.

Previously abstracted from *Proceedings of the Royal Society*, item 4A-49, 1949.

**4A-86. The Sizes of Atoms in Metallic Crystals.** (In English.) W. Hume-Rothery. *Physica*, v. 15, Apr. 1949, p. 29-33.

Great care is necessary for the sizes of atoms in different structures to be compared directly. The factors originally proposed by Goldschmidt for changes in coordination number must be regarded as rough approximations only and not used for accurate calculation until their exact basis is known. In the same way attempts made to deduce the exact numbers of bonding electrons by simple comparison of interatomic distances must be regarded with suspicion.

**4A-87. A Method for Calculating the Energy of a Bloch Wave in a Metal.** (In English.) David P. Shoemaker. *Physica*, v. 15, Apr. 1949, p. 34-39.

A mode of procedure which, it is hoped, will reduce the mathematical complexity attending the calculation without introducing too drastic approximations.

**4A-88. Slip in Metals.** (In English.) Lawrence Bragg. *Physica*, v. 15, Apr. 1949, p. 83-89; discussion, p. 89-91.

Use of "soap-bubble rafts" in the study of metallic crystal structure—a technique by which it has been possible to prepare "models" showing structures analogous to those of slip in metals.

**4A-89. Crystal Growth in the Solid State (Recrystallization).** (In English.) W. G. Burgers. *Physica*, v. 15, Apr. 1949, p. 92-106.

Lecture covers nucleation and growth; mathematical treatment of the course of recrystallization, mechanism of nucleation and growth, stimulated nucleation, selectivity of the growth process, stoppage of grain growth after primary recrystallization, and recrystallization considered as a process of local melting. 31 ref.

**4A-90. Suggestions Concerning Inter-crystalline Junction Processes During Recrystallization.** (In English.) G. A. Homes and M. Maquestan. *Physica*, v. 15, Apr. 1949, p. 107-110.

Lattice orientations measured in completely recrystallized iron specimens. All neighboring crystals seem to be twinned. Two types of twin junction between metal grains were observed: direct twinning of two crystals of normal size; and formation of a wedge-form twinned crystal. Observations lead to a scheme for the mechanism of recrystallization phenomena.

**4A-91. Transitions in Supercooled Metallic Solutions.** (In English.) G. Borélius. *Physica*, v. 15, Apr. 1949, p. 135-147.

Confined to the energetics and kinetics of disorder-order transformations and precipitation phenomena. 24 ref.

**4A-92. Microscopic Evidence of Orderly Precipitation in Some Fe-Ni-Al Alloys.** (In English.) A. J. Bradley. *Physica*, v. 15, Apr. 1949, p. 175-178.

**4A-93. Clustering in Solid Solutions.** (In English.) R. Smoluchowski. *Physica*, v. 15, Apr. 1949, p. 179-183.

Part of a general study of fluctuations in solid solutions. Case of binary solid solutions which can be described in terms of interactions between nearest neighbors but in which the two kinds of atoms have different effective ionic radii. The theoretical analysis clears up some puzzling anomalies in the Ag-Cu and Fe-Si systems. 10 ref.

**4A-94. Nouvelle théorie de l'agitation thermique.** (A New Theory of Thermal Agitation.) C. Crussard. *Physica*, v. 15, Apr. 1949, p. 184-188.

Applicability to study of various reactions in metals caused by thermal movements of atoms or groups of atoms. This theory eliminates some of the difficulties encountered in practical application of the Boltzmann formulas.

**4A-95. Investigation of Thermal Dilatation of Cubic Metals.** (In English.) A. Kochanovska. *Physica*, v. 15, Apr. 1949, p. 191-196.

The thermal dilatation of chemically pure Fe and Al was measured in different crystallographic directions with the aid of X-rays of three different wave lengths. The results obtained over a range of 22-366° C. showed in the case of iron an anisotropy of thermal dilatation. In the case of Al, no differences of that kind were detected

- up to 220° C. Suggests that perhaps some of the metals belonging to the cubic crystallographic system are actually not precisely cubic.
- 4A-96. Diffusie in metalen en legeringen.** (Diffusion in Metals and Alloys.) I. and H. J. D. Fast. *Metalen*, v. 3, May 1949, p. 191-195; June 1949, p. 215-222.
- First of four articles begins with a simple mathematical treatment of diffusion from the microscopic point of view. After giving a definition of coefficient of diffusion with stationary and nonstationary states of flow, means are discussed for measuring or estimating its value. Second of series discusses the statistical nature and the atomic theory of diffusion. (To be continued.)
- 4A-97. Residual Lattice Strains in Plastically Deformed Polycrystalline Metal Aggregates.** G. B. Greenough. *Proceedings of the Royal Society, ser. A*, v. 197, July 7, 1949, p. 556-567.
- Strains observed by X-ray diffraction methods in plastically extended polycrystalline aggregates were investigated. If several diffraction lines are examined, the strains vary both in magnitude and in sign. Theoretical explanation, conclusions from which are in satisfactory agreement with observations.
- 4A-98. Influence of Magnetic Field on Recrystallization.** R. Smoluchowski and R. W. Turner. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 745-746.
- Influence on Fe-Co alloys. Preliminary results indicate a change of the texture which can be qualitatively accounted for by considering the magnetostrictive properties of the alloy and their influence on the stability of the recrystallization centers.
- 4A-99. Constitution of Melts.** J. O'M. Bockris and J. W. Tomlinson. *Research*, v. 2, Aug. 1949, p. 362-368.
- Methods and equipment. Structures of liquid metals and salts; experimental evidence and theory of liquid silicate structures. 64 ref.
- 4A-100. Conception nouvelle concernant les transformations de l'acier.** (A New Conception Concerning the Transformations of Steel.) J. H. Andrew. *Revue de Metallurgie*, v. 46, Apr. 1949, p. 233-236.
- On the basis of the proposed theory and experimental data, the various transformations which take place in different carbon and alloy steels are explained.
- 4A-101. Änderung des Volumens beim Zerfall binärer Mischkristalle.** (Volume Changes Caused by the Dissociation of Binary Solid Solutions.) Alfred Durer. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 218-219.
- A method of calculating from the lattice data of the solid solution the volume change caused by precipitation of its components.
- 4A-102. On the Range of the  $\epsilon$  Phase in the Fe-Cr-Mn Ternary System.** (In Japanese.) Kenji Ono. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 22-27.
- 4A-103. Calculations of Simplest Equilibrium Diagrams of Binary Alloys.** (In Russian.) B. Ya. Pines. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 625-638.
- A method of analytical description of equilibrium diagrams of binary alloys is theoretically investigated. Results explain two experimentally observed types.
- 4A-104. Mise en évidence des tensions internes et des dislocations dans les métaux par le comportement photoélastique du chlorure d'argent.** (Evidence of Internal Stresses and Dislocations in Metals on the Basis of Photo-Elastic Behavior of Silver Chloride.) J. F. Nye. *Revue de Metallurgie*, v. 46, June 1949, p. 371-375; discussion, p. 375-376.
- Experiments using AgCl with respect to structural behavior under different forms of plastic deformation, bending, stretching, torsion, etc. These results, which are readily observed because of transparency, are believed analogous to those taking place in polycrystalline metals.
- 4A-105. Zur Theorie der Erholung.** (On the Theory of Recovery.) Doris Kuhlmann, Georg Masing, and Joseph Raffelsieper. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 241-246.
- An atomic theory for the recovery of plastically deformed metals. Comparison with experimental results for the recovery of Al monocrystals indicates satisfactory agreement with theory within a rather wide margin of error. 27 ref.
- 4A-106. Das Gesetz der Gefrierpunktniedrigung binärer eutektischer Schmelzen durch kleine Zusätze fremder Stoffe.** (The Law of the Reduction of the Freezing Points of Binary Eutectic Melts by Small Additions of Foreign Substances.) Erich Schell. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 246-248.
- Reduction of the eutectic temperature of binary alloys follows a law that is analogous to the classical law for reduction of freezing point, provided the addition is slightly soluble in both solid phases. The concentration change of the eutectic point cannot be computed without knowing the heat of miscibility of the ternary system.
- 4A-107. Zur Theorie der Rekristallisation.** (The Theory of Recrystallization.) Kurt Lucke and Georg Masing. *Zeitschrift für Metallkunde*, v. 39, Oct. 1948, p. 291-293.
- Petersen's method for computing the growth of nuclei is presented in simplified form. Critical analysis indicates that the validity of his theory becomes doubtful when the radius of the growing nucleus has quintupled.
- 4A-108. Analysis of Interstitial Diffusion Using Activity Methods.** A. G. Guy. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 607-610.
- Improved method indicates a possible approach to an adequate treatment of substitutional diffusion. Theoretical and experimental data are compared for carbon diffusing in iron. 10 ref.
- 4A-109. Beitrag zur graphischen Darstellung quaternärer Systeme.** (Graphical Representation of Quaternary Systems.) H. Klemm. *Archiv für Metallkunde*, v. 3, July 1949, p. 247-250.
- Method for constructing constitution diagrams of quaternary alloys, with special emphasis on the relation of temperature and concentration.
- 4A-110. Diffusie in metalen en legeringen.** (Diffusion in Metals and Alloys.) III and IV. (Concluded.) *Metalen*, v. 3, July 1949, p. 239-248; Aug. 1949, p. 261-270.
- The mechanism of diffusion in substitutional solid solutions and the influence of interatomic forces upon diffusion. The deleterious effect of hydrogen in iron and steel.
- 4A-111. (Book) Rutley's Elements of Mineralogy.** Ed. 24. H. H. Read. 525 pages. Mar. 1947. Thomas Murby & Co., 40 Museum St., W. C., London, England.
- Part I consists of chapters on chemistry, certain physical properties, atomic structure, optical properties, and occurrence of minerals, also one on elements of crystallography. Part II gives concise descriptions of the various mineral species. Differs from the previous edition mainly in the addition of the chapter on atomic structure.

**4B-74. Sur la pénétration de l'Hydrogene dans le Fer et quelques conséquences.** (Concerning the Penetration of Hydrogen Into Iron and Some of Its Consequences.) M. E. Darmois. *Bulletin de la Société Chimique de France*, Mar-Apr. 1949, p. D170.

The literature on the above.

**4B-75. State of  $\alpha$ -Iron in Annealed Martensite.** (In Russian.) L. S. Moroz and Yu. S. Terminasov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 353-390.

Investigated by X-ray diffraction using specimens of carbon steel water quenched from 900° C. and annealed for different periods and at different temperatures. Method of experimental investigation. 12 ref.

**4B-76. Periodicity of Deformation During Plastic Elongation and Contraction of Steel Having a Large Grain Size.** (In Russian.) P. O. Pashkov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 391-398.

Distribution of local deformation as applied to plastic elongation and contraction of mild low-carbon and medium-carbon steel with large grain size.

**4B-77. Recherches sur les variations de composition du protoxyde de Fer.** (Research on Variations in the Composition of Ferrous Oxides.) Jacques Bénard. *Bulletin de la Société Chimique de France*, Mar-Apr. 1949, p. D109-D116.

Problem was experimentally investigated in an attempt to establish the limits of existence of FeO between 570 and 1100° C. The point of equilibrium between the phases Fe, FeO, and Fe<sub>3</sub>O<sub>4</sub> is at 76.9% Fe at 580° C.

**4B-78. Etude du procesus de décomposition du protoxyde de Fer.** (Study of the Process of Decomposition of Ferrous Oxide.) G. Chaudron and J. Bénard. *Bulletin de la Société Chimique de France*, Mar-Apr. 1949, p. D117-D119.

The reaction  $4\text{FeO} \rightarrow \text{Fe}_3\text{O}_4 + \text{Fe}$  was investigated between 300 and 570° C. in which range it is exclusively in the solid state. The method of thermomagnetic analysis was used.

**4B-79. Formation and Expansion of Cracks in Hardened Steel Having a Heterophase Structure.** (In Russian.) V. A. Pavlov and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 465-470.

The origin and propagation of cracks during bending of specimens having the following structures: martensite with a ferrite lattice along boundaries of former austenite grains; martensite with bainite; martensite with globular inclusions of ferrite, and an annealed martensite with cementite lattice. Causes of decrease of strength upon incomplete hardening of steel.

**4B-80. Mechanism of the  $\gamma$ - $\alpha$  Transformation in Iron.** J. Savage. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 77-81, 89.

Recent work of H. Neerfeld and K. Mathieu (*Archiv für das Eisenhüttenwesen*, v. 20, Jan.-Feb. 1949, p. 69-73) and other pertinent literature on the subject. 11 ref.

**4B-81. A Metallographic Description of Fracture in Impact Specimens of a Structural Steel.** M. Baeyerz, W. F. Craig, Jr., and E. S. Bumpert. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 481-490.

Attempts to establish a definite relationship between such words as

"cleavage", "brittle", "shear", "ductile", "granular", "fibrous", and "silky" as used to describe the macroscopic appearance of fracture with corresponding microstructures. The fractures were made by impact testing of structural steel.

**4B-82. Discontinuous Crack Propagation.** L. D. Jaffe. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 526.

It has been generally believed that fracture originates at a point and, if the stress is sufficient, propagates across the material from this point. Evidence to the contrary is illustrated for a low-alloy steel. A theoretical explanation is offered.

**4B-83. Mechanism of the Formation of Pearlite in Steels.** Kotaro Honda. *Nature*, v. 164, Aug. 6, 1949, p. 229-230.

Simple explanation which assumes the boundaries of slip bands to be the seat of precipitation of cementite particles.

**4B-84. Structure of Tempered Martensite.** Jozef Mazur. *Nature*, v. 164, Aug. 6, 1949, p. 230-231.

Results of X-ray diffraction study of steels containing 0.89 and 1.2% C, previously subjected to very low-temperature treatment.

**4B-85. Better Silicon Irons.** T. Waterfall. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 82-83.

Research on the mechanism of nucleation and growth of metallic crystals to develop better silicon irons for the electrical industry.

**4B-86. Zur Thermodynamik der Eisenlegierungen.** (The Thermodynamics of Iron Alloys.) Willy Oelsen. *Stahl und Eisen*, v. 69, July 7, 1949, p. 468-475.

Calculating the equilibria of iron-rich alloys on the basis of simple thermodynamic data. This mathematical "synthesis" is based on the properties of the pure iron and thus permits revision of its heat-content curve. A series of explanatory examples are given, with special emphasis on such problems as the solubility of carbon in  $\alpha$ -iron and of phosphorus in  $\gamma$ -iron as well as equilibria in the Fe-C system.

**4B-87. Ueber den Ablauf der isothermen Austenitumwandlung eines Chrom-Magnetstahls sowie den Einfluss der Härtetemperatur und der Härtezeit.** (The Course of the Isothermal Austenite Transformation of a Chromium Magnet Steel and the Effect of Hardening Temperature and of Hardening Time.) Werner Jellinghaus. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 243-248.

The rate of the isothermal transformation in a permanent-magnet steel was determined over the range  $-180$  to  $700^\circ$ . Experimental procedure and data. 10 ref.

**4B-88. Influence de l'hydrogène sur la cohésion de l'acier.** (Influence of Hydrogen on the Cohesion of Steel.) Paul Bastien and Pierre Azou. *Comptes Rendus* (France), v. 228, May 23, 1949, p. 1651-1653.

Investigated for annealed low-carbon steel between  $15$  and  $-160^\circ$  C. In tensile testing an important factor indicating the influence of hydrogen content is the phenomenon of slip.

**4B-89. The Mechanism of Martensite Formation.** Alden B. Greninger and Alexander R. Troiano. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 590-598.

Mechanism described is the outcome of two new experimental determinations: the accurate evaluation of the lattice relationship between austenite and individual crystals of martensite, and measurement and analysis of the change in position that a volume of austenite undergoes when it transforms into a crystal of

martensite. For the latter, stereographic analysis of shear was employed. 18 ref.

**4B-90. Grain Size of Martensite After Treatment at Very Low Temperature.** Jozef Mazur. *Nature*, v. 164, Aug. 27, 1949, p. 358-359.

The grain size of austenite after different heat treatments was estimated from X-ray diffraction measurements. It was concluded that the grain sizes of martensite are not greatly different from those of the parent austenite.

**4B-91. Atlas of Isothermal Transformation Diagrams.** Iron and Steel Institute (London), Special Report No. 40, Mar. 1949, 63 pages.

Presentation includes explanatory text and micrographs.

## 4C—Nonferrous

**4C-75. First Progress Report on Titanium-Carbon and Titanium-Nitrogen Phase Diagrams.** J. P. Nielsen. *Office of Naval Research*, "Titanium; Report of Symposium on Titanium"; Mar. 1949, p. 153-157; discussion p. 157.

Objectives of research program at New York University. The diagrams are to be constructed from experimental data and will be confined only to the regions considered of practical interest for structural material, namely, from pure titanium to the compounds TiC, and TiN, respectively, and from the liquidus to about room temperature, the pressure being atmospheric. Preliminary phase diagrams estimated on the basis of the literature and theoretical considerations.

**4C-76. Sur les deux mécanismes de transformation des solutions solides plomb-oxygène de teneurs limites  $PbO_{0.35}$  et  $PbO_{0.57}$ .** (Mechanism of Transformation of Lead-Oxygen Solid Solutions of Contents Between the Limits  $PbO_{0.35}$  and  $PbO_{0.57}$ .) Théo Katz and René Faivre. *Bulletin de la Société Chimique de France*, Mar-Apr. 1949, p. D124-D127.

Chemical and crystallographic investigation indicated the presence of a zone of homogeneous solid solutions in this range. These solid solutions may be reduced or oxidized in a single phase, if the oxygen content does not exceed that corresponding to  $PbO_{0.57}$ . When this limit is exceeded, an irreversible two-phase reduction takes place. 15 ref.

**4C-77. Precipitation dans les alliages.** (Precipitation in Alloys.) A. Guinier. *Physica*, v. 15, Apr. 1949, p. 148-158; discussion, p. 158-160.

Treats structural aspects of transformation of a supersaturated solid solution to a mixture of equilibrium solution and crystals of the precipitated phase. An experimental investigation, using X-rays, of nuclei of supersaturated solid solutions during the first stage of aging. The alloys studied were those with spherical nuclei (Al-Cu, Al-Be), and those where the nuclei are not available for study (Al-Mg).

**4C-78. Sites for the Free Valence Electrons in Metallic Alloys of the Gamma Brass Type.** (In English.) A. J. Bradley. *Physica*, v. 15, Apr. 1949, p. 170-174.

Theoretical discussion.

**4C-79. The Structures of Some Metal Compounds of Uranium.** (In English.) R. E. Rundle and A. S. Wilson. *Acta Crystallographica*, v. 2, June 1949, p. 148-150.

Previously abstracted from U. S. Atomic Energy Commission, AEC-D-2388, item 4C-33, 1949.

**4C-80. Inverse Segregation in Non-Ferrous Alloys.** W. T. Pell-Walpole. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 103-115.

Including some previously unpublished work on segregation of Sn and P in both "gassy" and degassed billets of phosphor-bronze which were cooled unidirectionally. An attempt is made to correlate the various conditions under which segregation may occur with the most probable theories as to cause and mechanism. 40 ref.

**4C-81. Recovery and Recrystallization in Brass.** B. L. Averbach. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 491-494.

On the basis of X-ray extinction measurements it is concluded that recovery may be a process analogous to recrystallization. It is possible that small strain-free grains are formed during recovery, and that recrystallization occurs when there is rapid growth in the size of these strain-free regions. 10 ref.

**4C-82. Ferromagnetic Alloys in the Systems Cu-Mn-In and Cu-Mn-Ga.** F. A. Hames and D. S. Eppelsheimer. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 495-499.

A ferromagnetic Cu-Mn-In alloy was prepared having an ordered body-centered cubic structure, probably structurally analogous to the ferromagnetic beta Cu-Mn-Al and Cu-Mn-Sn alloys. Ferromagnetic Cu-Mn-Ga alloys were also prepared. Properties and structure. 19 ref.

**4C-83. Secondary Recrystallization in Copper.** M. L. Kronberg and F. H. Wilson. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 501-514.

Develops a formal relationship between pairs of orientations from a study of orientations of large grains produced during "secondary recrystallization" of twin-bearing cubically aligned copper. Experimental evidence indicates that the large grains are formed by nucleation and growth of new orientations, with nucleation apparently initiating at twin boundaries. Two types of orientations were found. A possible mechanism of "secondary recrystallization". The need for a theoretical analysis. 19 ref.

**4C-84. The Active Slip Systems in the Simple Axial Extension of Single Crystalline Alpha Brass.** Robert Maddin, C. H. Mathewson, and W. R. Hibbard, Jr. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 527-534.

Suggests that plastic deformation in 70-30 alpha brass begins by gliding on octahedral planes possessing cross-slip folds. 12 ref.

**4C-85. The Ordering Reaction in CoPt Alloys.** J. B. Newkirk, A. H. Geisler, and D. L. Martin. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 816.

In compositions of near 50-50 atomic %.

**4C-86. Formation of Alloys from Evaporated Metals.** H. J. Axon and G. A. Geach. *Research*, v. 2, Aug. 1949, p. 396.

X-ray and metallographic examination of several binary alloys prepared by evaporating two pure metals from separate molybdenum boats and condensing them simultaneously upon molybdenum foil at a temperature of  $30-50^\circ$  C.

**4C-87. Note on a Particular Type of Cold Working of Grains of a Brass by Rolling.** J. Schoofs. *Journal of the Institute of Metals*, v. 75, July 1949, p. 855-862.

Electro and etching procedure by which a new metallographic feature has been revealed in a certain number of crystals of an alpha brass that had received a particular annealing and cold-working treatment. It consists of a series of bright, narrow bands across the grains. Two possible explanations of their formation.

**4C-88. Aktivitäten im ternären flüssigen System Na-Cd-Hg.** (Activities in the Ternary Liquid System Na-Cd-Hg.) H. Frauenschill and F. Halla. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie*, v. 53, May 1949, p. 144-151.

Determines, by measuring emf's and vapor pressures, activities of Na and Hg in the above system. Methods of experimentation and computation.

**4C-89. Aktivitätsmessungen an flüssigen Natrium-Legierungen mit starken Abweichen von idealen Verhalten.** (Activity Measurements in Molten Sodium Alloys Which Deviate Strongly From Ideal Behavior.) K. Hauffe and A. L. Vierk. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie*, v. 53, May 1949, p. 151-161.

Emf's of an electrochemical series of the type: liquid sodium-glass-liquid sodium alloy were determined. The study included the Na-Tl, Na-Sn, and Na-Pb systems. Activities and "RT ln f" values calculated from measured results are plotted for the respective alloys and compared with their respective constitution and energy diagrams. 48 ref.

**4C-90. The Transformation of the  $\beta$  Phase of the Cu-Al System and the Effect of Mn Additions Upon It. II. The Tempering Process for Quenched  $\beta$  Alloys of the Cu-Al Binary System. Tempering of the  $\beta$  Phase. III. Tempering Phenomena in Quenched  $\beta$  Alloys of the Cu-Al Binary System. Tempering of the  $\gamma$  Structure. IV. The Effect of Mn Additions on the Tempering of  $\beta$  Aluminum Bronze.** (In Japanese.) Isao Tarora. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 6-18.

Part II: the  $\beta \rightarrow \beta' \rightarrow \beta''$  and reverse transformations were investigated by differential thermal analysis, measurement of change of specific electric resistance, differential dilatometry, measurement of hardness of tempered alloys, and X-ray analysis. The direct transformation takes place on quenching and the reverse on reheating of quenched alloys. Part III: transformations on heating quenched hypereutectoid alloys containing over 13.1% Al, their quenching, and effects on hardness. An acicular structure designated as  $\gamma'$  takes the place of the  $\beta$  mentioned in Part II. Part IV: effects of additions of 2-6% Mn on structure and hardness.

**4C-91. Concerning the Change in Structure of Rolled Zinc Resulting From Mechanical and Electrolytic Polishing.** (In Japanese.) Kyoichi Ike-mura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 27-29.

Determined by X-ray diffraction.

**4C-92. The Lattice Spacings of Substitutional Solid Solutions.** G. V. Raynor. *Transactions of the Faraday Society*, v. 45, July 1949, p. 698-708.

The lattice spacings for solid solutions of various elements in Cu, Ag, and Au were analyzed in examination of the suggestion that change in lattice spacing on alloy formation may be considered in terms of an atomic size factor and a valency factor operating together. Results confirm the dual nature of lattice distortion effects in simple binary alloys. 17 ref.

**4C-93. The Equilibrium Diagram of the System Lead-Tin.** G. V. Raynor. *Institute of Metals. Annotated Equilibrium Diagrams No. 6*, Jan. 1947, 4 pages.

One of a series. 15 ref.

**4C-94. The Equilibrium Diagram of the System Beryllium-Copper.** G. V. Raynor. *Institute of Metals. Annotated*

*Equilibrium Diagrams No. 7*, Feb. 1949, 5 pages.

One of a series. 12 ref.

**4C-95. Experimental Investigation of Electron Density in Crystals. 4. Electron Density of NiAl.** (In Russian.) N. V. Ageev and L. N. Guseva. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 225-233.

Structural factors for an alloy close to the NiAl composition were experimentally determined. Electron density is computed for six directions of the elementary nucleus of NiAl at a calculated temperature of 10,000°C. Bridges of increased electron density are observed between atoms of Ni-Al and Ni-Ni, indicating the presence of exchange forces between atoms. 12 ref.

**4C-96. Composition of Alloys Present in the Constitution Diagram Between Fe and CoAl.** (In Russian.) O. S. Ivanov and M. A. Skryabina. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 242-253.

On the basis of investigation of the energy states of solid solutions of Fe and FeSi, CoAl, and NiAl, the presence of a two-phase region between Fe and CoAl at room temperature is assumed and confirmed experimentally. 12 ref.

**4C-97. Sur la nature de la couche superficielle d'abrasion du laiton  $\alpha$ .** (Nature of the Superficial Layer on  $\alpha$  Brass After Abrasion.) Pierre A. Jacquet. *Comptes Rendus (France)*, v. 228, May 23, 1949, p. 1653-1655.

Experimental investigation using a new method developed by the author indicates that the surface structure of mechanically polished brass consists of disarranged crystals caused by rupture of the solid-solution grains. The assumption of Dance and Norris, that the cause of this phenomenon is recrystallization of the deformed alloy under the influence of local heating, is considered to be erroneous.

**4C-98. Das gerichtete Aufwachsen von Kupfer(1)-oxyd auf Kupfer-Einkristallkugeln.** (The Oriented Growth of Cuprous Oxide on Spherical Copper Single Crystals.) Erich Menzel. *Zeitschrift für anorganische Chemie*, v. 256, Mar. 1948, p. 49-64.

The orientation of Cu<sub>2</sub>O films on spherical monocrystals of copper was studied as a means of investigating physical and chemical phenomena on crystal surfaces, by optical and X-ray methods. 22 ref.

**4C-99. Die  $\gamma$ -Mischkristalle im System Kobalt-Mangan.** ( $\gamma$ -Solid Solutions in the Cobalt-Manganese System.) Armin Schneider and Wolfgang Wunderlich. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 260-263.

X-ray analyses of quenched Co-Mn alloys showed that below the solidus line the two metals form an interrupted series of solid solutions. A tentative Co-Mn constitution diagram is presented. 13 ref.

**4C-100. Über die Überstrukturphasen im System Platin-Nickel.** (Superstructural Phases in the Platinum-Nickel System.) Albrecht Kussmann and Helmut Ernst v. Steinwehr. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 263-266.

Proves radiographically the presence of an atomic order Ni<sub>3</sub>Pt and explains the differences in the two superstructural phases Ni<sub>3</sub>Pt and NiPt as regards kinetics of formation and properties.

**4C-101. Der Aufbau galvanischer Legierungsniederschläge. VI. Die Kadmium-Zink-Legierungen.** (The Structures of Galvanic Alloy Deposits. VI.

The Cadmium-Zinc Alloys.) Ernst Raub and Bernhard Wulhorst. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 268-270.

The galvanic deposition of Cd-Zn alloys from cyanide and acid electrolytes, the relation between cathode potential, composition, and structure of the deposits, and the results of X-ray and microscopic investigation as well as hardness measurements.

**4C-102. The Lattice Parameters of High Purity Alpha Titanium and the Effects of Oxygen and Nitrogen on Them.** Howard T. Clark, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 588-589.

Within the last 20 years at least three sets of lattice constants for the room-temperature (alpha) phase of titanium have been reported that differ greatly. Presents new values. Effects of oxygen and nitrogen indicate that two of the previously reported values are probably in error because of the presence of one or both of these elements.

**4C-103. Effect of Composition on the Wire Textures of Copper and Its Solid Solution Alloys.** Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 598.

Results of experiments on Cu and its alloys with Al, Ni, and Zn, after being drawn to 86 and 96.4% total reduction in diameter.

**4C-104. Structure and Nature of Kink Bands in Zinc.** J. B. Hess and C. S. Barrett. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 599-606.

Formation of kink bands during compression of single-crystal rods of zinc occurs by progressive rotation of the lattice within the band, rather than by twin-like abrupt shear. Rotations from a few degrees to over 80° were measured. Results indicate that kink bands are deformation bands resulting from the ordinary crystal-slip process, not from a new mechanism of deformation.

**4C-105. The Transformations in  $\beta$ -CuAl Alloys.** E. P. Klier and S. M. Grymkö. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 611-620.

Transformations for copper alloys containing 11.9 and 13.5% Al. Metallographic and X-ray results. 27 ref.

**4C-106. Compression Textures of Copper and Its Binary Alpha Solid Solution Alloys.** Walter R. Hibbard, Jr. and Delmar E. Trout, II. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 620.

Compression textures developed in copper alloys with Al, Ni, and Zn are shown to be essentially the same types as those reported by Barrett with compositional effects occurring at approximately the same per cent additions as previously reported for rolled sheet and drawn wire.

**4C-107. Annealing Twins in Copper and 70-30 Alpha Brass.** Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 635-636.

70-30 alpha brass is shown to have greater tendencies toward annealing twin formation than copper. The twins-per-grain ratio is essentially constant for Cu and 70-30 alpha brass over a wide range of deformation temperatures and annealing temperatures, except for the alpha brass at 600°C.

**4C-108. The Origin of Annealing Twins in Brass.** Robert Maddin, C. H. Mathewson, and Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 655-663.

Single crystals of 70-30  $\alpha$ -brass

were grown and homogenized. From these, tapered central sections were cut, etched to remove cold work, and electropolished. These crystals were extended at constant rate of loading and slip-line formation and position measured by X-ray methods.

**4C-109. Some Observations on the Rate of Secondary Recrystallization in High Purity Copper.** Anna M. Turkalo and David Turnbull. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 663-664.

Rate of the secondary transformation is much more rapid in high-purity copper than in OFHC copper. Effects of annealing at various temperatures after 90% reduction.

#### 4D—Light Metals

**4D-46. Relation entre l'existence d'imperfections de structure des cristaux uniques d'Aluminium pur et d'alliages Al-Zn et le processus de recristallisation.** (Relationship Between the Existence of Structural Imperfections in Single Crystals of Pure Aluminum and in Al-Zn Alloys and the Process of Recrystallization.) P. Lacombe and A. Berghézan. *Physica*, v. 15 Apr. 1949, p. 161-167; discussion, p. 167-169.

The existence of a crystalline substructure is shown to be closely connected with the manner of recrystallization of the metal and not with the process of aging observable at ordinary temperature. Experimental method.

**4D-47. Inclusions in Aluminium Crystals.** (In English.) T. J. Tiedema, W. May, and W. G. Burgers. *Acta Crystallographica*, v. 2, June 1949, p. 151-154.

Crystals, growing by recrystallization in fine-grained material, often do not consume some grains of the original material. They contain a number of inclusions, which do not vanish even after very long annealing. These reflect light simultaneously in the same direction. By means of the etching method of Lacombe and Beaujard and an X-ray method it is proved that these inclusions are deformed grains of the original material possessing a spinel-twin relationship to the surrounding crystal. All four possible spinel-twin positions are represented. This is not valid when the "inclusions" are larger than the average original grain size. By means of the etching method, it was possible to determine the orientation of inclusions with dimensions down to 30 $\mu$ . 21 ref.

**4D-48. Laminated Structure in Recrystallized Aluminium.** G. L. Bucknell and G. A. Geach. *Nature*, v. 164, Aug. 6, 1949, p. 231.

As shown by electron microscope examination. The structure has a mean spacing of about 600 Å, and the laminations themselves have a nodular structure.

**4D-49. Über die Löslichkeit von Chrom, Vanadium, Titan, Mangan, Zirkon in Aluminiumlegierungen.** (The Solubility of Chromium, Vanadium, Titanium, Manganese, and Zirconium in Aluminum Alloys.) Gustav Siebel. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 214-217.

The solubility at different temperatures of the above was determined in an Al alloy containing 4.5% Zn and 3.5% Mg.

**4D-50. The Equilibrium Diagram of the System Aluminum-Magnesium.** G. V. Raynor. *Institute of Metals, Annotated Equilibrium Diagrams No. 5*, Nov. 1945, 5 pages.

One of a series. 32 ref.

**4D-51. Analyse d'une texture de solidification du type basaltique.** (Analysis of a Solidification Structure of the

Basaltic Type.) J. Hérenghuel. *Revue de Métallurgie*, v. 46, May 1949, p. 309-314.

Aluminum 99.5% pure was solidified at a very regular high rate resulting in the basaltic structure. Results of micrographic and crystallographic investigation.

**4D-52. Emploi de l'oxydation anodique pour l'étude de l'homogénéité des solutions solides Al-Mg.** (Application of Anodic Oxidation to Study of Homogeneity of Al-Mg Solid Solutions.) J. Hérenghuel and R. Segond. *Revue de Métallurgie*, v. 46, June 1949, p. 376-381; discussion, p. 382.

The presence of surface irregularities on the above solid solutions restricts to a great extent their electropolishing. Causes of formation of such structural defects and methods for their elimination.

**4D-53. Gefüge- und Eigenschaftsanomalien in manganhaltigen Aluminiumlegierungen als Folge von Unterkühlungen.** (Structural and Property Anomalies in Manganese-Containing Aluminum Alloys as a Result of Supercooling.) K. L. Dreyer and M. Dudek. *Metall*, July 1949, p. 219-222.

Cause of the above anomalies was found to be the great tendency of these alloys to supercool, resulting in supersaturated Mn solutions. Heat treating causes the excess Mn to precipitate in fine particles, thus causing further notable property changes. Similar supercooling effects have been noted with additions of Cr, Ti, and V. 29 ref.

**4D-54. Zur Kenntnis des manganhaltigen Gefügebestands in technischen Aluminiumlegierungen.** (Concerning the Manganese-Containing Constituents in Commercial Aluminum Alloys.) Hugo Joachim Seemann and Maria Dudek. *Zeitschrift für Metallkunde*, v. 39, Oct. 1948, p. 319-320.

Photomicrographs reveal presence of the above phase at the grain boundaries in duralumin annealed at temperatures above 500°C.

**4D-55. Solubility of Titanium in Liquid Magnesium.** K. T. Aust and L. M. Pidgeon. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 585-587.

Apparatus and procedure. Solubility was found to be extremely small. Freezing-point and interplanar-spacing values for high-purity Mg. 14 ref.

**4D-56. Recrystallization Texture and Coarsening Texture in High Purity Aluminum.** Paul A. Beck. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 627-634.

Experimental determination of the relationship among deformation, recrystallization, and coarsening textures. Results are compared with those of other investigators, and are critically analyzed. Includes pole-figure diagrams and macrographs. 25 ref.

**4D-57. Influence de la répartition des imperfections de structure des cristaux de solution solide aluminium-zinc sur la cinétique de leur durcissement structural à 20°.** (Influence of the Structural Defects in Al-Zn Solid-Solution Crystals on the Kinetics of Their Structural Hardening at 20°C.) Paul Lacombe and Aurel Berghézan. *Comptes Rendus* (France), v. 228, May 30, 1949, p. 1733-1735.

The degree of structural hardening of polycrystalline test specimens differs greatly according to the type of structure present. Data for an Al alloy containing 8% Zn.

**4D-58. Sur les images au microscope électronique des alliages aluminium-cuivre durcis.** (Surface Appearance of Hardened Al-Cu Alloys as Revealed by Electron Microscopy.) Raymond Castaing and André Guinier. *Comptes*

*Rendus* (France), v. 228, June 27, 1949, p. 2033-2035.

Different surface structures obtained during hardening of a 4% Cu aluminum alloy, and corresponding to those indicated by X-ray investigation, are determined by electron microscopy.

For additional annotations indexed in other sections, see: 2B-227-228-231-248-249; 2C-46-74; 2D-27; 3A-185; 3B-177-180; 3C-172-175-182; 3D-59; 5C-16-19; 6A-103; 6C-66; 8-242-243; 11-272-289; 309; 14B-92; 14D-48; 19D-55



#### 5A—General

**5A-45. Designing for Production by Powder Metallurgy.** Joseph Bonnano. *Steel*, v. 126, Aug. 22, 1949, p. 68-70, 74, 77.

Manufacture of model-train parts. Large savings in labor and material are obtained by replacement of other methods by powder metallurgy.

**5A-46. Informal Open Discussion of Powder Metallurgy.** *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 5-20.

**5A-47. Effects of Impurities in Metal Powders.** F. V. Lenel. *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 65-69; discussion, p. 69-73.

Some basic principles which govern the effect of impurities in metals and alloys in general. Examples are taken from the effects of impurities on the properties of molded and sintered compacts, processing of the powders, and also on preparation of metal powders.

**5A-48. Powder Metallurgy from the Design Engineer's Viewpoint.** Joseph L. Bonnano. *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 74-91; discussion, p. 91-92.

See abstract from *Electrical Manufacturing*, item 5A-29, 1949.

**5A-49. Determination of Boundary Stresses During the Compression of Cylindrical Powder Compacts.** M. E. Shank and John Wulff. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 561-570.

Electrical strain-gage technique based on the elastic properties of the thick-walled tube used as the die. Theory of the method; experimental procedure and results. 10 ref.

**5A-50. A Dilatometric Study of the Sintering of Metal Powder Compacts.** Pol Duwez and Howard Martens. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 571-577.

A systematic investigation of change in length during sintering of compacts. Pure metals investigated were Cu, Fe, Co, and Mo. Binary

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mixtures were Cu-Ni, Cu-Zn, Mo-Ni, and Cr-Mo. Results and apparatus used.

## 5B—Ferrous

5B-20. Les vitesses de réaction au voisinage des points de transformation magnétique. Application à la cémentation du Fer. (Rates of Reaction in the Neighborhood of Magnetic Transformation Points. Application to Sintering of Iron.) H. Forestier and G. Nury. *Bulletin de la Société Chimique de France*, Mar-Apr. 1949, p. D193-D195.

The sintering of metals and ferromagnetic alloys close to the Curie point. Results obtained confirmed the previous theory of the author that the ratio of the reaction reaches a maximum at the Curie point.

5B-21. Methods of Iron Powder Manufacture and Their Influence on Powder Properties. H. Bernstorff. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 93-102. Translated from the German.

Various methods of manufacturing iron powder used in Germany, including grinding, atomization, chemical reduction, and electrolytic methods. Relative size and shape of powders and their effects on physical properties of the product. 19 ref.

5B-22. Electrical Resistivity Measurements on Iron-Silicon Compacts Prepared by the Powder Metallurgy Procedure. Frank W. Glaser. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 475-480.

Values for the specific electrical resistivity of Fe-Si alloys containing 6-50% Si were determined. Electrical resistance varies with degree of diffusion of the alloys. Hot pressing and heat treating can be used to produce Fe-Si alloys in suitable forms. Nitrogen in the atmosphere has little effect upon electrical resistivity. 10 ref.

5B-23. Some Effects of Oxygen on the Performance of Iron Powder. Joseph J. Cordiano. *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 21-28; discussion, p. 28-35.

From results of the experimental work, it appears that internal oxides in iron powders do not materially affect the mechanical properties of sintered iron compacts, but do strongly decrease the density of green and sintered compacts. In addition, volume and linear shrinkage increase with increasing internal oxide content.

## 5C—Nonferrous

5C-16. Fabrication of Titanium and Investigations of Titanium-Nickel Alloys in the Bureau of Mines Laboratories. J. R. Long. *Office of Naval Research*, "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 27-46; discussion, p. 47-48.

See abstracts from *Metal Progress*, items 4c-36 and 5D-1, 1949.

5C-17. Oxidation of Titanium Carbide Base Ceramals Containing Molybdenum, Tungsten, and Cobalt. M. J. Whitman and A. J. Repko. *National Advisory Committee for Aeronautics*, Technical Note 1914, July 1949, 49 pages.

Oxidation-penetration characteristics of a number of the above at 1625, 1785, and 2000° F. Ceramals were composed of TiC and 5, 10, 20, and 30% Mo, W, or Co. Co ceramals were considered better than W ceramals in overall oxidation resistance and Mo ceramals were inferior to both.

5C-18. Elevated-Temperature Properties of Several Titanium Carbide Base Ceramals. George C. Deutsch, Andrew J. Repko, and William G. Lidman. *National Advisory Committee for Aeronautics*, Technical Note 1915, July 1949, 47 pages.

Investigated from 1600 to 2400° F. to obtain information on bonding mechanisms. Compositions studied were TiC plus 5, 10, 20, and 30% by weight each of W, Mo and Co. Density, tensile strength, modulus-of-rupture, coefficient of linear expansion, and oxide-coating composition and structure were determined.

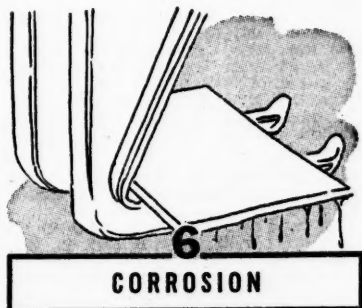
5C-19. Das Verhalten gepresster binärer Gemische von Gold- und Silberpulvern mit anderen Metallpulvern beim Sintern. (The Sintering Behavior of Compacted Binary Mixtures of Gold and Silver Powders With Other Metal Powders.) Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 206-214.

Sintering properties of Au-Ag, Au-Cu, Au-Ni, Ag-Zn, Ag-Cu, Ag-Pb, Ag-Fe, and Ag-Ni powder mixtures were studied. The relation between properties and structural changes caused by the sintering process.

5C-20. Metal Powder and Hard Particles Made Into Steel-Backed Bearings. Harry L. Strauss, Jr. *Metal Progress*, v. 56, Sept. 1949, p. 359.

Extension of hot pressing process described in March 1947 to pilot-plant manufacture of steel-backed bearings wherein the "antifriction" material may be one of numerous combinations of powder metals, carbides, or borides. These bearings are required to operate at high temperature and extreme speeds without galling or binding. Method of manufacture.

For additional annotations indexed in other sections, see:  
2C-45; 12A-175; 23B-46



## 6A—General

6A-101. Effects of Internal Stresses. *Metal Progress*, v. 56, Aug. 1949, p. 242-244, 250, 252, 254.

Reviews last section of "Symposium on Internal Stresses in Metals and Alloys", Institute of Metals, London. See item 27a-142, 1948.

6A-102. Surface Reactions of Metals; Effect on Wear, Friction, Lubrication and Finishing. G. Tolley. *Metal Industry*, v. 75, July 22, 1949, p. 68-70, 73; July 29, 1949, p. 89-91; Aug. 5, 1949, p. 112-113.

Surface reactions are classified in two groups—physicochemical and physicochemical. Various methods for measurement of surface roughness and surface area; the corrosion mechanism, corrosion inhibitors, high-temperature oxidation, prefer-

ential corrosion, frictional properties, and lubricants, with special mention of graphites. 26 ref.

6A-103. Oberflächenprobleme des chemischen Verhaltens metallischer Werkstoffe. (Surface Problems in the Chemical Behavior of Metallic Materials.) W. Guertler. *Metallüberfläche*, v. 3, sec. A, July 1949, p. A133-A141.

Contrasts the behavior of single crystals of metals with that of multicrystalline aggregates encountered in practice. Importance of the surface in relation to the space lattice. Adherent and nonadherent corrosion products. Shows that the corrosive behavior of alloys is determined by microscopic and submicroscopic structural factors. The basic prerequisites for producing chemically resistant alloys.

6A-104. Die Messung der Oxydationsgeschwindigkeit und Oxydschichtdicke von Metalloberflächen sowie der Lokalelementarität zwischen Metall und Metalloxyd. (Measurement of the Rate of Oxidation and Oxide Film Thickness on Metal Surfaces. Also the Local Galvanic Activity Between the Metal and Its Oxide.) F. Tödt, R. Freier, and W. Schwarz. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie*, v. 53, May 1949, p. 132-142.

The effects of oxide films on the atmospheric corrosion of metal surfaces (Fe, Cu, Cr-Ni steel, Pt and Ag) were studied. Rate of oxidation and film thickness were determined by measuring the current density in coulombs per sq. cm. at the metal surfaces. 17 ref.

6A-105. Gas-Metal Reactions. Andrew Dravnieks and Hugh J. McDonald. *Iron Age*, v. 164, Aug. 25, 1949, p. 78-82; Sept. 1, 1949, p. 84-86.

Reactions where the products of interaction are nonvolatile and form scale on the surface of the metal. Utilization of X-ray, electron diffractions, radioactive tracer, and electrical methods in studying reaction products. Techniques for measuring gas-metal reaction rates. Second and concluding installment: various continuous and discontinuous measuring techniques for measuring reaction rates, of which the microbalance and gas-volumetric methods are considered the most versatile. 71 ref.

6A-106. Work in Progress at the Chemical Research Laboratory, Teddington. *Electroplating and Metal Finishing*, v. 2, Aug. 1949, p. 525-529.

Accelerated corrosion testing; corrosion inhibitors; and inorganic chromatography.

6A-107. Corrosion Prevention. Frank LaQue. *Canadian Metals and Metallurgical Industries*, v. 12, Aug. 1949, p. 14-17, 26, 29, 37.

The commonest method is use of protective coatings. Other methods, such as control of environment, cathodic prevention, design, and adjustment of composition of the metal.

6A-108. Procedures for Testing the Corrosion Resistance of Metals. F. A. Champion. *Industrial Chemist and Chemical Manufacturer*, v. 25, Aug. 1949, p. 383-387.

Modern corrosion testing methods and the relative importance in service of the various corrosion effects. 16 ref.

6A-109. Surface Attack of Metals by Fatty Acids and the Formation of Lubricating Layers. D. Tabor and E. D. Tingle. *Butterworths Scientific Publications* (London), "Surface Chemistry", 1949, p. 217-220.

New explanation for boundary lubrication of solids. Points out that former explanation is an oversimplification.

6A-110. Etallement des Huiles à la Surface des Métaux Projétés. (Spreading of Oils over the Surfaces of Gold and Silver Films.) P. Cotton. *Butter-*

worths Scientific Publications (London). "Surface Chemistry", 1949, p. 233-238.

Experimental results for polar and nonpolar oils. Film thickness and structure.

**6A-111.** Role de l'attaque du métal par les acides gras à longue chaîne dans le frottement onctueux. (Role of the Attack of Metal by Long-Chain Fatty Acids in Lubricated Friction.) J. Pomey and F. Loury. *Métaux & Corrosion*, v. 24, May 1949, p. 135-144.

Results of experimental investigation with particular emphasis on factors such as chain length and chemical reactions occurring at the lubricated surface. 15 ref.

**6A-112.** Die Atmosphärische Korrosion der Metalle. (Atmospheric Corrosion of Metals.) G. Schikorr. *Archiv für Metallkunde*, v. 2, no. 7, 1948, p. 223-250.

Literature survey and results of atmospheric corrosion tests in Germany showing effects of weather variations, atmospheric types (city, rural, marine, or industrial). Results of quantitative determination of the relationship between sulfur content of the air and atmospheric corrosion. 14 ref.

## 6B—Ferrous

**6B-132.** Die Lokalelementwirkung bei der Eisen-Auflösung in Salzsäure. (The Galvanic Cell Effect of Dissolving Iron in Hydrochloric Acid.) H. K. Wickert and H. Pilz. *Archiv für Metallkunde*, v. 3, June 1949, p. 214-221.

Experiments made to produce galvanic iron-electrolyte vs. copper cells in metal powders and to measure the rate of solution of these powders in HCl.

**6B-133.** Praskani mekke oceli vlivem mezikrystalické koroze v roztocih dusikanu amonneho. (Intergranular Corrosion Cracking of Mild Steel by Ammonium Nitrate Solutions.) M. Smialowski, B. Kopec, and J. Michalik. *Hutnické Listy*, v. 4, Mar. 1949, p. 70-79. See abstract from *Prace Badawcze Głównego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), item 6B-100, 1949.

**6B-134.** The Breakdown and Repair of Oxide Films on Iron. T. P. Hoar. *Transactions of the Faraday Society*, v. 45, July 1949, p. 683-693.

Influence of the film-rupturing anions chloride and perchlorate, and the film-repairing anions carbonate, nitrite, and chromate. Film breakdown is often preceded by partial repair. The nature and production of pores. An analogy between the electrolytic properties of oxide films and paint films is pointed out. 27 ref.

**6B-135.** Acid-Resisting Silicon Iron. R. V. Riley. *Foundry Trade Journal*, v. 87, Aug. 18, 1949, p. 221-224.

Corrosion resistant properties, foundry procedures, and applications.

**6B-136.** Corrosion of Steel in Sulfur-Producing Tubes; Frasch Process. D. A. Shock and Norman Hackerman. *Industrial and Engineering Chemistry*, v. 41, Sept. 1949, p. 1974-1977.

Coupons were exposed in the flow line from a sulfur well. Rates of corrosion were found to vary with variation in production conditions. The rate was negligible in the presence of sulfur alone but increased tremendously during water contacting periods in the presence of sulfur. Rate and nature of attack were reproduced in the laboratory in a simple bomb reactor.

**6B-137.** Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 41, Sept. 1949, p. 73A-74A.

Boiling 65% HNO<sub>3</sub>, test to predict

corrosion of stainless steel in other environments. Doubtful value of this test.

**6B-138.** Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 3. Maximum and Minimum Requirements of Sodium Chromate Determined. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil*, v. 129, Sept. 1949, p. 156, 158, 160-162, 164, 168.

Results of Bureau of Mines tests in the Cotton Valley field.

**6B-139.** Activité électrochimique des pellicules de rouille et la corrosion du fer par la rouille en milieu humide aéré, voisin de la neutralité. (Electrochemical Activity of the Rust Film and Corrosion of Iron by Rust in a Moist, Aerated, Approximately Neutral Medium.) E. Herzog. *Métaux & Corrosion*, v. 24, May 1949, p. 119-134.

Corrosion of iron is initially caused by the difference in oxygen content followed by a cathodic effect pertaining to rust and oxygen. Thus, both of these agents activate the depolarization. 16 ref.

**6B-140.** Die Lokalelementwirkung bei der Eisenauflösung in Salzsäure. (The Local Cell Effect of the Solution of Iron in Hydrochloric Acid.) K. Wickert and H. Pilz. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 207-216.

Conflicting reports (by Todd, Evans, and Wickert) on the solubility of Fe in HCl induced the authors to study the effect of surface roughness on solubility.

**6B-141.** Eine unzuverlässige Anwendung von Chromstahl in der Praxis. (An Improper Practical Use of Chromium Steel.) W. Katz. *Metall*, July 1949, p. 222-223.

Why Cr steel, because of its tendency towards intercrystalline corrosion, is not a suitable material for industries working with the chlorine salts of the alkali and alkaline earth metals.

**6B-142.** An Inhibitor of Pitting in 18-8. A. Sourdillon. *Metal Progress*, v. 56, Sept. 1949, p. 356.

Asks for information concerning above for use to prevent pitting of stainless steel tank cars used to transport milk. The pitting is caused by use of a bactericidal solution of alkaline hypochlorite and sodium chloride. Some test results in which sodium silicate seemed to prevent corrosion.

**6B-143.** Further Field-Test Results on Use of Corrosion Inhibitors for Secondary Flood Waters. E. T. Heck, J. K. Barton, and W. E. Howell. *Oil and Gas Journal*, v. 48, Sept. 8, 1949, p. 83, 85, 89, 91, 94.

Earlier work indicated rosin amine D acetate was an effective bactericide and fungicide. Investigation of this and similar substances was extended to determine effect on growth of organisms in the water systems.

**6B-144.** Corrosion Control. *Oil and Gas Journal*, v. 48, Sept. 15, 1949, p. 107-109, 112, 114-115.

Experiences with a variety of inhibitors at West Tuleta gas field, Texas. A semipolar organic reagent used to coat the pipe and its application by injection.

**6B-145.** Corrosion of Mild Steel by Sulphuric Acid. H. R. Archer and J. Howlett. *Chemistry & Industry*, Aug. 27, 1949, p. 605-607.

Experimental results for 95 and 98% H<sub>2</sub>SO<sub>4</sub>.

**6B-146.** Corrosion of Iron and Steel by Industrial Waters and Its Prevention. *Iron and Steel Institute* (London). Special Report No. 41, Mar. 1949, 56 pages.

Illustrated survey. 99 ref.

## 6C—Nonferrous

**6C-56.** Kinetics of the Reactions of Zirconium With O<sub>2</sub>, N<sub>2</sub>, and H<sub>2</sub>. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 515-525.

Studied as a function of time, temperature, pressure, surface preparation, and stability of the particular film. The vacuum microbalance method was used. 34 ref.

**6C-57.** Hydrofluoric Acid Versus Construction Materials. *Chemical Engineering*, v. 56, Aug. 1949, p. 233-234.

Part I of a symposium in which a representative group of construction materials is evaluated for services involving HF. Separate articles on "Carbon and Graphite", by J. F. Revilock; "Chlorimets", by Walter A. Luce; and "High-Silicon Irons", by Walter A. Luce.

**6C-58.** Corrosion in Multiple Layer Wound Coils. Howard Orr. *Communications*, v. 29, July 1949, p. 18-19.

Part II of report on progress achieved in overcoming electrolytic corrosion in multiple layer coils; tests used to determine characteristics of corrosion. (To be continued.)

**6C-59.** Corrosion in Multiple Layer Wound Coils. Part III. Procedures Involved in Evaluating Materials for Electrolytic Corrosion Characteristics; Calculating Corrosion Distribution. Howard Orr. *Communications*, v. 29, Aug. 1949, p. 22-23.

**6C-60.** Tensions internes, fissures dues aux tensions et destruction corrosive du laiton. . . . Eigenspannungen, Spannungsrisse und korrosiver Zerfall des Messings. (Internal Stresses, Tension Cracks, and Corrosive Decomposition of Brass.) R. Stettler. *Pro-Metal*, v. 2, June 1949, p. 406-412.

Causes of the spontaneous cracking of semi-finished and finished brass products were investigated. Effect of soldering and hot shortness on the propensity of brass and nickel-silver to cracking.

**6C-61.** Das Verhalten gepasteter Bleisammler während u. nach längerer Nichtbenutzung. (The Behavior of Paste-Coated Storage Battery Plates During and After Extended Periods of Non-Use.) E. Hoehne. *Archiv für Metallkunde*, v. 3, May 1949, p. 185-191. Results of an investigation with respect to corrosion and deterioration over periods of non-use up to 400 days.

**6C-62.** The Beaker-Corrosion Test for Lubricating Oils. F. W. H. Matthews. *Journal of the Institute of Petroleum*, v. 35, June 1949, p. 436-453.

A laboratory test for evaluating the corrosive potentialities of lubricating oils towards Cd-Ni bearing metal. Results correlating with those obtained by the Bristol single-cylinder Hercules engine.

**6C-63.** Porosity of Electrodeposited Metals. V. Measurement of the Corrodibility of Metal Foils. N. Thon, Denis Kelemen, and Ling Yang. *Plating*, v. 36, Sept. 1949, p. 928-929, 959.

A gas-permeability method used on electrolytic nickel foil produced from sulfate and chloride baths, wrought Ni foil, and electrolytic Cu foil from a sulfate bath. Corrosive media were vapor above a 3N HCl solution; a moisture-saturated, 6 mole % SO<sub>2</sub>, atmosphere, and a 5% NaCl solution.

**6C-64.** Electronographic Investigation of the Oxidation of Copper at Elevated Temperatures. (In Russian.) P. D. Dankov and D. V. Ignatov. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Sec-

tion of Chemical Sciences), May-June 1949, p. 234-237.

Structure of oxide films formed on a thick copper test specimen at 200° C. after different periods of exposure to the atmosphere. Mechanism of film formation. Includes diffraction patterns.

6C-65. Zum Mechanismus der Rissbildung bei der Spannungskorrosion homogener Mischkristalle. I. Die Ursache für das Auftreten inter- und transkristalliner Risse. (The Mechanism of Cracking in the Stress-Corrosion of Homogeneous Alloys. I. The Cause of Inter and Intracrystalline Cracks.) Ludwig Graf. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 275-280.

Research on Ag-Au and Cu-Au alloys shows that the type of cracking depends mainly on the nature of the stress-producing agent and that intracrystalline cracks can be caused only by highly oxidizing agents while intercrystalline cracks are caused by weak oxidizing agents. X-ray diagrams. 18 ref.

6C-66. Influence de la transformation ordre-désordre sur l'activité chimique des laitons. (Influence of the Order-Disorder Transformation on the Chemical Activity of  $\beta$ -Brass.) Georges Nury and Hubert Forestier. *Comptes Rendus (France)*, v. 229, July 11, 1949, p. 123-124.

Investigated for  $\beta$ -brass containing 48% Zn up to about 460° C., by determining the change of rate of oxidation with temperature. Results for both  $\alpha$ - and  $\beta$ -brass are charted.

6C-67. Chemical Reactions of Intermetallic Phases. I. Disintegration of the Intermetallic Compounds Ag<sub>3</sub>Al, Mg<sub>2</sub>Pb. (In Russian.) E. E. Cherkashin, F. A. Derkach, and S. M. Przevalot-skaya. *Zhurnal Obshchei Khimii (Journal of General Chemistry)*, v. 19 (81), May 1949, p. 798-804.

Cases of chemical reactions of intermetallic phases were investigated, in which metallic alloys in air, under ordinary conditions, disintegrate into powder. Nature of the chemical processes occurring. Factors influencing disintegration. Kinetics of such reactions as indicated by the curve of corrosion rate vs. time.

For additional annotations indexed in other sections, see: 4A-80; 4C-98; 7B-179; 20B-131



CLEANING and FINISHING

#### 7A—General

7A-132. Production of Clad Metals by Electric Fusion. *Industrial Heating*, v. 16, Aug. 1949, p. 1389-1390, 1392. Condensed from paper by R. K. Hopkins.

Method of producing composite materials for pressure vessels and other equipment. Three experimental machines were tried in the course of the development. The final design, which is in full-scale production, applies alloy cladding to the surface of the slab while in a ver-

tical position, requiring use of a mold and four carbon steel wire electrodes.

7A-133. Evaluation of Paint Films: The Interchemical Adherometer. Clifford J. Rolle and Theresa L. Dietrich. *Analytical Chemistry*, v. 21, Aug. 1949, p. 996-997.

Method and apparatus for resolving stripping-force measurements of organic coatings on metal surfaces into their basic factors of plasticity and adhesion.

7A-134. Parts Finishing at Yale and Towne. *Iron Age*, v. 164, Aug. 25, 1949, p. 76-77.

Picture story shows spray-painting, cleaning, drying, and baking equipment used for the wide variety of parts used in industrial trucks, hoists, scales, and related products.

7A-135. Note on the Theory of Electrolytic Double Layers. A. J. Dekker. *Canadian Journal of Research*, v. 27, sec. B, July 1949, p. 682-687.

The mechanism suggested by Gurney for the formation of a double layer at the interface of a metal and a solution containing its ions is applied to a diffuse double layer. The diffuse part of the double layer is treated in a way that differs from Stern's method, leading to a more convenient formula for the potential of the diffuse part. Numerical values and a comparison with Stern's results.

7A-136. Metallizing Extends Life of Food-Processing Equipment. John Wakefield. *Food Industries*, v. 21, Aug. 1949, p. 63-66.

Procedures and applications.

7A-137. Dekapieren von Metallen mit Natriumhydrid. (Scouring Metals With Sodium Hydride.) *Metalloberfläche*, v. 1, sec. B, July 1949, p. B53-B54.

Cleaning of ferrous and numerous nonferrous metals with sodium hydride and a method of generating the hydride.

7A-138. Über die Metallionenadsorption an Metalloberflächen. (The Adsorption of Metal Ions on Metal Surfaces.) Otto Erbmann, Wilfrid Herr, and Malene Widemann. *Zeitschrift für Naturforschung*, v. 3a, Dec. 1948, p. 637-645.

Radioactive indicators were used to determine the adsorption behavior of different metal ions on solid metals and liquid mercury. The method and the results. 14 ref.

7A-139. Production Line Polishing. *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 78-79.

Operation of the Hill Acme polishing machine.

7A-140. Machine Finishes. C. L. Vandeman. *Machine Design*, v. 21, Sept. 1949, p. 99-104.

Selection of paints and application procedures for finishing machine tools.

7A-141. New Metallizing Techniques Offer Production Economies and Simplified Design. John E. Wakefield. *Iron Age*, v. 164, Sept. 8, 1949, p. 80-84.

See abstract from *Modern Machine Shop*, item 7A-66, 1949.

7A-142. Porcelain Enamel Process Defects; Causes and Possible Cures. Part IX. Star and Stone Marks. M. E. McHardy. *Ceramic Industry*, v. 53, Sept. 1949, p. 57.

7A-143. Tank Linings; Principal Materials Used for Corrosive Conditions. (Concluded.) V. Evans. *Metal Industry*, v. 75, Aug. 12, 1949, p. 126-128.

Previously abstracted from *Journal of the Electrodepositors' Technical Society*. See item 7A-111, 1949.

7A-144. Finishing of Wire Forms and Small Stampings. E. B. Anderson. *Products Finishing*, v. 13, Sept. 1949, p. 26-30, 32, 34, 36.

Buffing, barrel tumbling, and barrel plating of these parts, mostly steel.

## Specify **ALOX** 937 in the preparation of preservative lubricants used in **Low Temperature Operations**



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**7A-145. Safety Switch Finishing.** H. O. Cunningham. *Products Finishing*, v. 13, Sept. 1949, p. 56-58, 60.

How mechanization of the paint department resulted in rapid, automatic finishing of switches.

**7A-146. Theorie der Phosphatierung.** (Theory of Phosphating.) A. Wüstefeld. *Archiv für Metallkunde*, v. 3, July 1949, p. 253-255.

The theoretical principles of phosphating in acid and in alkaline baths are the same. In both cases, the removal of H or OH ions in excess results in formation of colloids with charges opposite that of the attacked metal and, thus, in strong adherence of the film to the metal. A method for phosphating aluminum.

**7A-147. (Book) Hot-Tinning.** W. E. Hoare. 112 pages. 1948. Tin Research Institute, Fraser Road, Greenford, Middlesex, England.

Working instructions for the production of hot-tinned coatings on fabricated articles and components. Manufacture of tinplate is not included.

## 7B—Ferrous

**7B-171. Cleaning and Finishing of Pig Fan Parts.** *Industrial Heating*, v. 16, Aug. 1949, p. 1428, 1430, 1432.

Improved conveyor-belt system of cleaning, drying, painting, finishing, and assembly of cooling fans.

**7B-172. Pickling Acid Measurement and Control.** D. H. Krouse. *Blast Furnace and Steel Plant*, v. 37, Aug. 1949, p. 961-964.

Use of "Flowrator", a rotameter type of flow meter in which a float moves vertically in a tapered tube in direct response to changes in rate of flow.

**7B-173. The Hudson Finish.** *Industrial Finishing*, v. 25, Aug. 1949, p. 14-16, 18, 20, 23.

Processes involved in finishing Hudson bodies.

**7B-174. Cleaning and Painting Used Steel Drums.** William J. Miskella. *Industrial Finishing*, v. 25, Aug. 1949, p. 58-60, 62, 66, 68.

Mass production setup for cleaning and inspecting insides and outsides of drums and for spray painting and baking outside coatings.

**7B-175. Pickling Combined With Galvanizing in Continuous Coil Galvanizing Line.** *Steel*, v. 126, Aug. 22, 1949, p. 81.

For coating hot roll strip of 12, 16, and 18 gage.

**7B-176. Metal-Spraying Plant for Rolled-Steel Sections.** *Engineering*, v. 168, Aug. 5, 1949, p. 127, 132.

British equipment for spraying a protective Al coating, 0.004 in. thick, on the surfaces of certain steel joists and other sections required for structural steelwork.

**7B-177. The Role of Blast Cleaning Apparatus in Bonding Rubber to Metal.** J. F. Farrell. *Rubber Age*, v. 65, Aug. 1949, p. 549-551.

Equipment and procedures.

**7B-178. Trouble Shootin'.** John L. McLaughlin. *Better Enameling*, v. 20, Aug. 1949, p. 36.

Porcelain-enamel defect known as tearing; causes and remedies.

**7B-179. The Protective Action of Sprayed Aluminium Coatings on Steel.** G. Tolley. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 377-384.

The galvanic behavior of steel plus sprayed Al was investigated in various solutions during one week's immersion. The corrosion processes affecting changes in electrode potential during immersion in relation to observed early rust-staining of sprayed

Al coatings on steel. The effect of  $Al_2(SO_4)_3$  on the corrosion of steel. 19 ref.

**7B-180. Some Applications of Continuous Hot-Dip Galvanizing.** Heinz Bablik. *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1657-1660.

Wire, tube, strip, and other applications. Schematic diagrams of machinery.

**7B-181. Der Kohlenstoff als Fehlerquelle beim Emaillieren.** (Carbon as a Source of Defects in Enameling.) Werner Engelhardt. *Metallüberfläche*, v. 3, sec. A, July 1949, p. A141-A145.

Among the causes of defective enameling are formation of CO and CO<sub>2</sub>, and release of atomic hydrogen from the steel. Means of preventing such defects. 14 ref.

**7B-182. Die Kinetik der Bedeckungsercheinungen, insbesondere die des Phosphatierungsvorganges.** (The Kinetics of Coating Phenomena, Especially That of the Phosphating Process.) W. Machu. *Archiv für Metallkunde*, v. 3, June 1949, p. 203-208.

Develops a general rule for the rate of reaction in the formation of protective metal coatings. The rate of film formation at the cathode is proportional to the area of the anode. Application of the rule to 11 specific examples. 11 ref.

**7B-183. Palm Oil Substitutes for Hot Dip Tinning.** W. R. Johnson, L. C. Kinney, and John M. Parks. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 99-102. A condensation.

Previously abstracted from *American Iron and Steel Institute*, Preprint. See item 7B-95, 1949.

**7B-184. Removing Mill Scale from Steel.** Rick Mansell. *Organic Finishing*, v. 10, Aug. 1949, p. 20-21.

Several methods currently used. Suggested procedures.

**7B-185. Protective Coatings for Steel (Cementation Processes).** Jerome L. Bleiweis. *American Machinist*, v. 93, Sept. 8, 1949, p. 143.

Purpose, nature of coating, treatment, procedure, notes, and comments in outline form for colorizing and sherardizing.

**7B-186. Observations on the Reactions of Red Lead.** Manfred Ragg. *Paint, Oil and Chemical Review*, v. 112, Sept. 1, 1949, p. 28, 30.

With special reference to the mechanism of the rust-inhibitive action of red-lead paints on iron and steel.

**7B-187. Traitement superficiel de la fonte malleable.** (Surface Treatment of Malleable Cast Iron.) Pierre Tyvaert. *Fonderie*, June 1949, p. 1626-1627.

A new method of chemical tin coating of malleable iron, developed on a laboratory scale. Possibility of application on an industrial scale.

**7B-188. Flusstahlemaillierung im chemischen Apparatebau.** (Enameling Cast Steel Used for Chemical Apparatus.) Karl Frick. *Chemie-Ingenieur-Technik*, v. 21, July 1949, p. 249-258.

Methods and equipment. Testing the enameled parts for porosity, thermal, and chemical properties. Possible methods of repair.

**7B-189. Adsorption und Absorption von Oberflächenschichten, insbesondere von Phosphatoberflächenschichten, und deren Plastizität.** (Adsorption and Absorption of Surface Films, Especially Phosphatic Films, and Their Plasticity.) H. Wüstefeld. *Archiv für Metallkunde*, v. 3, June 1949, p. 223-224.

The physicochemical principles of bonderizing. The properties of a given phosphate film depend to a large extent on the conditions of formation. Tests demonstrate the adsorption of soap by the phosphate film and the deposition of films on clean uncoated and on bonderized metal surfaces.

**7B-190. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel.** (Pickling, Etching, Pretreating, Rust Removal, and Rust Preventives.) IV. Richard Springer. *Metallüberfläche*, v. 2, Dec. 1948, p. 271-275.

Literature and patent references for the years 1935-1943. Pickling in the enameling industry, pickling and pickling apparatus, and regeneration of spent pickling baths. For other installments see items 7B-25, 7B-61, and 7B-114, 1949.

**7B-191. Finishing the Lustron Home.** Part III. Ezra A. Blount. *Products Finishing*, v. 13, Sept. 1949, p. 14-20, 22.

How cabinet parts for the Lustron Home are finished.

**7B-192. Zur Kurzprüfung von Konservendosenlacken.** (Short-Time Testing of "Tin" Can Lacquers.) H. Niesen. *Archiv für Metallkunde*, v. 2, no. 7, 1948, p. 237-248.

Experiments to test the mechanical and chemical properties of three different lacquers on blank and bonderized sheet metal. Corrosion resistance was determined in distilled water, 2% salt solution, and 2% salt plus 2% acetic acid solution. The bonderized sheets proved to be chemically more resistant than the blank sheets. 10 ref.

**7B-193. Das Inkromverfahren.** (The "Inkrom" Process.) F. Steinberg. *Archiv für Metallkunde*, v. 2, no. 8, 1948, p. 253-254.

A chromizing process for converting the surfaces of ordinary steel parts into high-test, rust resistant steel.

**7B-194. Rostschutz von Isolatorenkappen aus Temperguss.** (Rust-Preventive Coatings for Malleable Iron Insulator Caps.) F. Roll. *Archiv für Metallkunde*, v. 2, no. 8, 1948, p. 254-256.

Results obtained over a period of years with metallic and nonmetallic coatings. Concludes that hot-dip zinc coatings are superior.

**7B-195. Über die Erhöhung der Haftfestigkeit von Einbrennlackschichten auf Bandstahl und Feinblechen.** (Increasing the Adhesiveness of Baked Lacquer Coatings on Strip Steel and Thin Sheets.) F. Eisenstecken. *Archiv für Metallkunde*, v. 2, no. 8, 1948, p. 256-258.

Effects of cleaning and pretreatment of the metal surface on the adhesiveness of lacquer coatings and their behavior.

**7B-196. Über die Nachbehandlung von Phosphatschichten mit Chromaten.** (Subsequent Treatment of Phosphate Coatings with Chromates.) W. Machu. *Archiv für Metallkunde*, v. 3, July 1949, p. 250-253.

The porosity of phosphate films is reduced by treating with  $NaCrO_4$ ,  $K_2Cr_2O_7$ , or  $CrO_3$ . Chromate-treated phosphate coatings have an increased electrical resistance not only because of their reduced porosity, but also because of the passivating effect of the chromate in the pores of the protective film.

## 7C—Nonferrous

**7C-31. Rolled Gold Plate for Coating Nonferrous Metals.** *Modern Metals*, v. 5, Aug. 1949, p. 25.

New method is claimed to save considerable time and to improve quality in comparison with conventional polishing and electroplating. Adapted particularly to jewelry, fountain pens, and similar items.

**7C-32. Brass Parts Processed Automatically Through 9 Operations.** *Industrial Heating*, v. 16, Aug. 1949, p. 1370-1372.

An almost completely mechanized installation comprises a unique system of continuous processing brass screw bases for house fuses, through a series of cleaning, annealing, and

pickling operations which require but two relatively small, compact pieces of equipment.

**7C-33. Precious Metal Paints.** H. V. Anderson. *Ceramic Age*, v. 54, Aug. 1949, p. 84, 86-87.

Paints as applied in the electrical and electronic fields rather than for decorative purposes. Properties and procedures for application to ceramic bodies.

**7C-34. Vaporized Metals Coat Surfaces.** Jerome L. Bleiweis. *American Machinist*, v. 93, Sept. 8, 1949, p. 118-122.

Plating Al onto glass, Zn onto paper, and Ag onto cellophane are among the many applications of the high-vacuum vaporization process described.

**7C-35. Die Castings in the Automotive Industry: Hardware and Trim.** *Die Castings*, v. 7, Sept. 1949, p. 18-20, 62-66. Finishing procedures.

**7C-36. Abrasive Blasting Applications.** J. F. Farrell. *Die Castings*, v. 7, Sept. 1949, p. 45-46, 48-50.

As applied to die castings. Surface preparation before painting, removal of flash and burrs, and elimination of symptoms of porosity.

**7C-37. Bronzing of Brass.** Pierre Tyvaert. *Foundry Trade Journal*, v. 87, Aug. 25, 1949, p. 249. Translated from *Fonderie*.

Surface preparation, surface treatment, and drying procedures.

**7C-38. Westinghouse Copper Wire Mill at Buffalo, New York. Part II. Wire and Wire Products.** v. 24, Sept. 1949, p. 764-766, 800-801.

Enameling of round wire; other insulation for round wire; packaging, storing, and shipping.

## 7D—Light Metals

**7D-39. Surface Treatment and Finishing of Light Metals. Part 3. Mechanical Surface Treatments and Finishes for Aluminum and Its Alloys. Part 4. Chemical Cleaning and Pre-Treatment Processes.** S. Wernick and R. Pinner. *Sheet Metal Industries*, v. 26, July 1949, p. 1493-1504; Aug. 1949, p. 1731-1738, 1743.

63 references.

**7D-40. Un nouveau procédé de brillantage de l'Aluminium: l'Alupol.** (A New Process for Polishing Aluminium: The "Alupol" Process.) P. Juniere and C. Etienne. *Revue de l'Aluminium*, v. 26, June 1949, p. 216-218.

The process makes no use of electric current, but consists principally of two baths, according to the surface to be treated and to the result desired. The first has a polishing effect and a specific solvent action on surface irregularities; the second is a super-finishing bath. Both types of baths are used after heating to a carefully controlled temperature.

**7D-41. Some Properties of Aluminium Flake Powder. 3. The Nature and Role of Leafing.** Gunter W. Wendon. *Paint Manufacture*, v. 19, Aug. 1949, p. 265-271, 286.

The influence of a number of factors, including particle size and relative humidity on the leafing phenomenon. Methods for determination of leafing power are compared. Relative importance of leafing power and the various fields of application of Al flake powder.

**7D-42. Finishing Alumtile, a New Building Material.** Frank E. Ehrett and F. Harold Higgins. *Organic Finishing*, v. 10, Aug. 1949, p. 6-9, 14.

Unique method of production. Small and large tiles are precoated, then blanked and formed in a final operation.

**7D-43. Cleaning Aluminum for Surface Treatment.** Gilbert C. Close. *Light Metal Age*, v. 7, Aug. 1949, p. 6-7, 26-28.

Various methods used by Douglas Aircraft.

**7D-44. Inorganic Finishes for Light Metals.** Jerome L. Bleiweis. *Product Engineering*, v. 20, Sept. 1949, p. 114-118.

Cost, availability, and theoretical factors in the selection of electroplated metallic coatings, and oxide or chemical conversion coatings. Chemical treatments for optimum corrosion protection.

**7D-45. Aluminum—Its Surface Preparation and Finishing. Part I.** E. R. Yarham. *Products Finishing*, v. 13, Sept. 1949, p. 38-40, 42, 44, 46, 48, 50, 52.

Cleaning and degreasing, polishing processes, blasting, barrel polishing, and chemical surface treatments.

**7D-46. Stand der Oberflächenschutzbehandlung der Leichtmetall-Legierungen.** (Surface Protection Methods for Light-Metal Alloys.) E. Nachtigall. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 194-197.

Various methods and their effects on mechanical properties of the respective alloys.

For additional annotations indexed in other sections, see:

4C-91; 10A-126; 19B-173; 22A-204; 22B-311



## ELECTRODEPOSITION and ELECTROFINISHING

**8-226. (Book) Zinc and Cadmium Plating.** 50 pages. Imperial Smelting Corp., Ltd., 37 Dover Street, London, W.1, England. 6s., net.

Protection of iron and steel against corrosion by the application of Zn and Cd electrodeposits. Applications and preparation of articles for plating, and anodes. The deposition of Zn from acid ZnSO<sub>4</sub>, alkaline Zn(CN)<sub>2</sub>, and Zn-Hg solutions. Bright Zn plating, Cd plating, determination of the thickness of Zn and Cd deposits and aftertreatment of the deposits.

**8-227. Some Interesting Manufacturing Operations at Ascot Gas Water Heaters Ltd.** (Concluded.) H. Clark and R. Wall. *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1681-1684.

Techniques employed in the polishing and plating department.

**8-228. A Survey of Some Specialized Aluminium Alloys for Anodic Treatment.** J. F. G. Herenguel. *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1739-1743.

Research on the methods of anodic treatment and on properties of the metals and alloys suitable for such treatment has led to the development of "precision" alloys intended to give a perfect finish after anodizing. Essential characteristics of these alloys. 16 ref.

**8-229. Recherches sur le polissage électrolytique des aciers, du chrome et des alliages légers en vue de l'examen**

*micrographique.* (Research on Electro-polishing of Steels, Chromium, and Light Alloys as an Aid to Their Micrographic Examination.) P. A. Jaquet. *Revue de Métallurgie*, v. 46, Apr. 1949, p. 214-226; discussion, p. 226-227.

New bath in which acetic anhydride is replaced by acetic acid, and perchloric acid is decreased to not more than 50 cc. per liter is easy to prepare without risk of explosion, even when handled by inexperienced personnel. Optimum conditions of operation. For the polishing of high-strength light alloys, such as Al-Zn-Mg alloys, a hot chromic-phosphoric acid solution is proposed, at 5-10 volts. 18 ref.

**8-230. Betrachtungen über elektrolytische Niederschläge.** (Observations on Electrolytic Deposits.) Carl E. Heussner, A. R. Balden, and L. M. Morse. *Metallüberfläche*, v. 1, sec. B, Apr. 1949, p. B2-B7; May 1949, p. B21-B23; June 1949, p. B33-B37.

Various electrolytic factors affecting the structure of metal plating. 15 ref.

**8-231. Über verschiedene Vergoldungsverfahren.** (Concerning Different Gold Plating Methods.) Otto Loeblich. *Metallüberfläche*, v. 1, sec. B, July 1949, p. B55-B57.

Gold plating for ornamental color effect and for protection against corrosion.

**8-232. Neue Vergoldungsverfahren.** (New Gold Plating Processes.) Max Hirschmann. *Metallüberfläche*, v. 1, sec. B, July 1949, p. B57-B59.

Two new German patented processes for heavy hard gold plating and gold plating for color effect.

**8-233. Vergoldung nach dem Exudor-Verfahren.** (Gold Plating by the Exudor Process.) *Metallüberfläche*, v. 1, sec. B, July 1949, p. B59-B60.

In this process, an organic diaphragm is inserted in the bath. The resulting gold deposits are said to be extremely dense and lustrous.

**8-234. Die elektrolytische Abscheidung von Metallen aus komplexe Ionen enthaltenden Lösungen.** (The Electrolytic Precipitation of Metals from Solutions Containing Complex Ions.) Ernst Raub and Bernhard Wulhorst. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie*, v. 53, May 1949, p. 142-144.

Questions Glazunov and Schlöter's theory that metals precipitate from the above solutions in secondary form.

**8-235. Hard Chromium Plating; Electrolytic Deposits on Light Alloys.** J. I. Cordwell. *Chemical Age*, v. 61, Aug. 6, 1949, p. 191-194.

A satisfactory base, surface preparation, the acid immersion solution, composition of electrolytes. Porosity and corrosion.

**8-236. An Introduction to Electrophoresis.** A. H. Stuart. *Electroplating and Metal Finishing*, v. 2, Aug. 1949, p. 513-518.

The phenomenon of electrophoresis is closely allied to those of electroplating. The process is believed to be of great potential importance. Basic principles.

**8-237. Control of Electroplating Solutions by Analysis and Observation. IX. The Control of Nickel Plating Solutions. II.** K. E. Langford. *Electroplating and Metal Finishing*, v. 2, Aug. 1949, p. 519-523.

Control of those constituents peculiar to bright nickel solutions of the cobalt-formate type. A metallurgical method for magnesium, previously ignored in plating chemistry.

**8-238. Plating Processes Open New Markets for Light Metals.** Jerome L. Bleiweis. *Light Metal Age*, v. 7, Aug. 1949, p. 8-9, 18, 20.

Varied applications of plated Al

and Mg. Cleaning and plating procedures, including bath recipes.

**8-239. Hydrogen Embrittlement in Copper Electroplating.** C. A. Zapffe and M. E. Haslem. *Plating*, v. 36, Sept. 1949, p. 908-913, 972.

Hydrogen is considerably more active in Cu plating processes than is commonly believed. Injurious embrittlement of the steel base may develop even in the complete absence of visible hydrogen evolution. Problems of low ductility of the steel and of porosity and poor adhesion of the plate should be reexamined from the standpoint of hydrogen activities. 17 ref.

**8-240. Electropolishing Silver: Processes; Bath Compositions; Current Densities.** W. M. Hesselberger. *Metal Industry*, v. 75, Aug. 26, 1949, p. 167-168. Reviews recent literature.

**8-241. Application de la méthode Jacquet au polissage électrolytique des maillechorts.** (Application of Jacquet's Method for Electropolishing of German Silver.) M. Giroudot. *Revue de Métallurgie*, v. 46, June 1949, p. 383-386; discussion, p. 386.

Chemical composition of electrolyte and optimum operating conditions for the polishing of German silver containing 10% Ni and also with higher Ni contents and additions of Pb dispersed in the solid solution.

**8-242. Laws of the Crystallization of Thin Needles of Silver.** (In Russian.) K. M. Gorbunova and A. I. Zhukova. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 605-615.

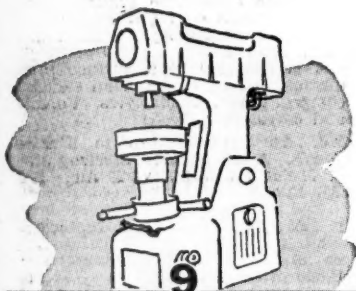
Influence of various factors on the electrodeposition of needle-shaped crystals of silver from  $\text{AgNO}_3$ . 10 ref.

**8-243. Crystallochemical and Diffusion Mechanisms of Electro-Crystallization.** (In Russian.) K. M. Gorbunova and P. D. Dankov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 616-624.

Laws of the growth of threadlike crystals, especially of silver deposited from  $\text{AgNO}_3$ .

For additional annotations indexed in other sections, see:

3B-192; 3C-174; 4C-101; 6C-63; 7A-144; 7D-44; 10A-127; 18A-30



PHYSICAL and  
MECHANICAL TESTING

**9-245. Testing of Bearing Materials.** M. M. Khrushchov. *Metal Progress*, v. 56, Aug. 1949, p. 238-239. Translated and condensed.

Previously abstracted from *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, item 9-104, 1949.

**9-246. Hot-Spin Tests of Bladed Jet-Engine Rotors.** H. B. Saldin and P. G. DeHuff, Jr. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 605-612.

Four-bladed disks were tested in an apparatus designed to spin the rotors in as near engine operating conditions as possible, in accordance with a predetermined schedule of temperature gradient, temperature, and speed. Test results are analyzed.

**9-247. Comparison of High-Temperature Alloys Tested as Blades in a Type B Turbosupercharger.** W. C. Stewart and H. C. Ellinghausen. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 613-620.

Previously abstracted from *American Society of Mechanical Engineers, Paper No. 48-A-96*, 1948. See item 9-62, 1949.

**9-248. Changes in Internal Damping of Gas-Turbine Materials Due to Continuous Vibration.** G. B. Wilkes, Jr. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 631-634; discussion p. 634.

Previously abstracted from *American Society of Mechanical Engineers, Paper 48-A-95*, 1948. See item 9-61, 1949.

**9-249. Designing Cast Iron Crankshafts and Center-Frames for Diesel Engines.** T. O. Kuivinen. *American Foundryman*, v. 16, Aug. 1949, p. 28-32.

Use of stresscoat and electrical-resistance strain gages. Shows savings of 53% in costs as compared to a welded steel frame. Weight was reduced 14%. Design details and stress-analysis techniques.

**9-250. Temperature and Metals.** F. C. Lea. *Edgar Allen News*, v. 28, July 1949, p. 325-329.

Effect of temperature on certain properties of metals with particular reference to creep. Creep testing equipment and typical data. (To be continued.)

**9-251. Essais des matériaux dans l'industrie métallurgique. IV. Tache, importance et principaux procédés de recherches . . . Die Materialprüfung in der Metallindustrie. IV. Aufgaben, Bedeutung und wichtigste Untersuchungsverfahren.** (Materials Testing in the Metal Industry. IV. Problems, Significance, and Principal Testing Methods.) A. Meyer. *Pro-Metal*, v. 2, June 1949, p. 396-405.

Concludes illustrated survey.

**9-252. Bemerkung zum Steilabfall der Schlagbiegeähigkeit von Zinklegierungen.** (Remarks on the Sudden Drop in the Impact-Bending Strength of Zinc Alloys.) Nikolaus Ludwig. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 219-220.

Correct determination requires testing at temperature intervals considerably smaller than the usual 20° C. The drop depends on the alloy as well as on the shape of the specimen.

**9-253. Some Measurements of Hardness of Metals Using a Microhardness Tester.** (In Japanese.) M. Okada, Y. Kuriyama, T. Kitani, and K. Uemura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 29-33.

Use of tester and results of typical measurements.

**9-254. Application of SR-4 Strain Gages to Creep Testing.** *Testing Topics*, v. 4, June, July, Aug. 1949, p. 4-5.

Offer a convenient, simple, accurate, and sensitive means of measuring room-temperature creep of metals and alloys in the laboratory. Experimental procedure followed in the work at the Bureau of Mines.

**9-255. Reducing Cost of Fatigue Testing.** Hanns J. Maier. *Machine Design*, v. 21, Sept. 1949, p. 137-139.

Accelerated fatigue testing apparatus and procedure. The apparatus

is basically a rotating cantilever-beam machine.

**9-256. 30-Ton Universal Testing Machine.** *Engineering*, v. 168, Aug. 12, 1949, p. 165-167.

Machine for investigating the properties of special high-tensile steels (90-100 tons per sq. in.) in tubular and flat form.

**9-257. Relation entre les résultats donnés, par différents essais d'emboutissage effectués sur des toiles d'alliage léger et le comportement de ces toiles en atelier.** (Relation Between Results Obtained From Different Deformation Tests on Light-Alloy Sheets and Behavior of Such Sheets in Service.) L. Beaujard. *Revue de Métallurgie*, v. 46, May 1949, p. 287-290.

Five different test methods (Erickson, Guillery, Persoz, Jovignot, and "KWI") were investigated. Results indicate superiority of the latter.

**9-258. Determination of Number of Revolutions of High-Speed Centrifugal Ram-Impact Machines and Work Expended in Fracture of Test Specimens.** (In Russian.) P. G. Korolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 723-729.

Method and apparatus. Comparatively high friction in the ram supports does prevent its use for determination of impact strength at high rates of impact.

**9-259. Production of Deformed Test Specimens From Intermetallic Compounds.** (In Russian.) E. M. Savitskii, V. V. Baron, and M. A. Tykina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 729-732.

Method and apparatus for production by hot pressing and hot extrusion. Shows that the concept of intermetallic compounds as brittle substances is correct only over a definite temperature range, and that such compounds behave as plastic substances under certain conditions. Deformed test specimens of the intermetallic compounds  $\text{MgZn}$ ,  $\text{MgZn}$ , and  $\text{MgZn}$ , and of the intermetallic  $\beta$  and  $\gamma$  phases in the Al-Mg system with different concentrations of components were obtained.

**9-260. New Testing Machines for Determining Mechanical Properties of Materials.** (In Russian.) Kh. N. Dement'ev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 733-736; discussion, p. 736-737.

Describes new machine developed by Soviet engineers for tensile testing up to 5 tons, and also a hydraulic test machine for loads up to 50 tons.

**9-261. Problem of Determination of Plasticity by Rolling Onto a Wedge.** (In Russian.) Yu. M. Chizhikov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 737-739.

Method applicable to metals and alloys. It was found that plasticity of cast metal at high temperatures is lower than plasticity of metal of same composition which has previously been rolled. Stainless steel and other Cr-Ni steels were tested.

**9-262. Über Schlagversuche an Flussstahlproben mit allgemeinen Folgerungen für Untersuchungen an stossartig beanspruchten festen Stoffen.** (Impact Tests on Ingot Steel Specimens With General Conclusions on the Behavior of Solids Subjected to Impact-Like Stresses.) K. Fink. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, July 1949, p. 193-214.

Carbon steels were subjected to impact tension and compression testing. Results indicate that the evaluation must consider the propagation of the impact waves even at impact velocities produced by the ordinary pendulum-type impact testing machine. A method using central impact on cylindrical bars, with stress and strain measurements made by resistance gages, is proposed. 25 ref.

9-263. Über die Tiefziehfähigkeit von Blechen und ihre Bestimmung. (The Deep Drawing Properties of Metals and Their Determination.) E. Mohr. *Metall*, Dec. 1948, p. 405.

Shows in what respects Erichsen's deep drawing test fails to be universally applicable.

9-264. A New Scale of Hardness. G. B. Smith. *Engineer*, v. 188, Aug. 26, 1949, p. 235.

Advantages of new Russian scale over the Mohs and Knoop scales. No standards are required, since the hardness numbers are derived from experimental values expressed in kg. per sq. mm. Comparative values for different materials are tabulated.

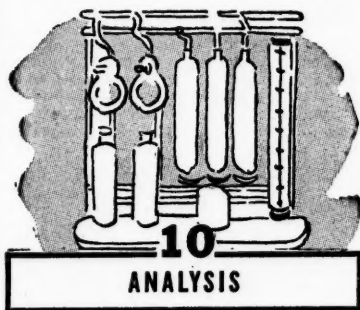
9-265. Fatigue Under Combined Pulsating Stresses. H. Majors, Jr., B. D. Mills, Jr., and C. W. MacGregor. *Journal of Applied Mechanics*, v. 16 (Transactions of the American Society of Mechanical Engineers, v. 71), Sept. 1949, p. 269-276.

Special combined-stress pulsator used to subject thin-walled cylindrical tubes to various ratios of combined (in phase) pulsating stresses. The material investigated was annealed SAE 1020 steel. Tension tests and uniaxial completely reversed rotating bending fatigue tests were made in the axial and tangential directions to study anisotropy. 13 ref.

9-266. Investigation of State of Stress of Transparent Three-Dimensional Models in a Beam of Parallel Rays of Polarized Light. (In Russian.) N. I. Prigorovskii and A. K. Preiss. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), May 1949, p. 686-700.

Method using plates, cut from three-dimensional models, which are "chilled" under load. Each point of such a plate, retaining elastic deformation obtained during stressing of the model, is assumed to be an optically anisotropic crystal. Optical properties of such plates are related to their state of stress and permit determination of direction and size of the three main stresses acting at any point. Includes experimentally verified simplifications applicable to standard machine parts.

For additional annotations indexed in other sections, see: 3A-192; 3B-173-178; 3D-60-61; 5A-49; 12-182; 22B-328



## 10A — General

10A-112. Problemes d'analyse polarographique moderne. (Problems of Modern Polarographic Analysis.) P. Souchay. *Bulletin de la Société Chimique de France*, Mar.-Apr. 1949, p. D97-D107.

Survey. 57 ref.

10A-113. Luminescent Analysis of Minerals. (In Russian.) G. F. Komovskii. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya* (Bulletin of the Academy of Sciences of the USSR, Physical Series), v. 13, Mar.-Apr. 1949, p. 248-249; discussion, p. 249-250.

Simple apparatus based on the principle of cathode luminescence. Applications in mineralogy, particularly in minerals containing rare-earth elements.

10A-114. Potentiometric Method for Determination of Aluminum in Bronzes and Steel. (In Russian.) B. G. Ivanov and S. M. Bezuyaiko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 511-514.

Possibility in the presence of the basic elements in Al-Fe, Al-Fe-Mn and Al-Fe-Ni; and a potentiometric method for direct determination of Al in these bronzes and a steel.

10A-115. Spectrographic Analysis; Use of the General-Purpose Source Unit for Non-Ferrous Alloys. P. T. Beale. *Metal Industry*, v. 75, July 15, 1949, p. 43-45, 49.

Methods in use at the British Non-Ferrous Metals Research Assoc. for analysis of miscellaneous metal samples.

10A-116. (Book) *Analyse der Metalle*. (Analysis of Metals.) O. Proske and H. Blumenthal. Vol. I, ed. 2. 508 pages. 1949. Springer Verlag, Berlin, Germany. 32 Rm.

First in a series of manuals, edited by the Chemical Division of the Society of German Metallurgists and Miners. It represents the joint work of 60 experts in analytical methods. The elements are dealt with in alphabetical order by chapters, describing not only the principles of analysis, but also their application to raw materials and finished products.

10A-117. Electrographic Analysis For Identifying High-Temperature Alloys. Marvin E. Levy. *Iron Age*, v. 164, Aug. 18, 1949, p. 98-100.

Rapid detection of Cr, Ni, Co, Mo, W, Ti, and Fe in high-temperature alloys is made possible by spot tests applied to electrographic analysis. The technique. Specific instructions for detection of the above elements in 11 alloys.

10A-118. Spectrophotometric Determination of Cobalt as Cobalt (II) Chloride in Ethanol; Determination of Water in Ethanol. Gilbert H. Ayres and Betty Vining Glanville. *Analytical Chemistry*, v. 21, Aug. 1949, p. 930-934.

Optimum range for measurement with the instrument and procedure used is 100-400 p.p.m. of Co, with an accuracy of 0.5%. The effect of diverse ions was studied. The method was tested by comparison with other methods in the assay of a cobalt salt and in the analysis of a standard steel. Water modified the color of the cobalt chloride-ethanol solutions; this effect is the basis for a method for estimating water in ethanol.

10A-119. 5, 6-Dimethyl-1, 10-Phenanthroline; Spectrophotometric Constants as Ferrous Complex and Use as Redox Indicator for Determination of Iron by Oxidation With Dichromate. G. Frederick Smith and Warren W. Brandt. *Analytical Chemistry*, v. 21, Aug. 1949, p. 948-950.

10A-120. Determination of High Percentages of Copper With a Beckman Spectrophotometer. Robert Bastian. *Analytical Chemistry*, v. 21, Aug. 1949, p. 972-974.

Method has a precision of 1-3 parts per thousand. It utilizes the color of the cupric ion contained in 10% perchloric acid solution. The commonly occurring colored metal ions, Co, Fe, Cr, and N, in concentrations up to 4% each, do not interfere. The method has been applied to a lead



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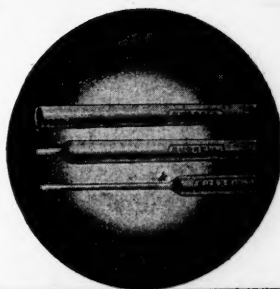
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brass, a phosphor bronze, and a synthetic sample.

**10A-121. Determination of Hydrogen; Universal Gasometric Micromethod.** Leonard P. Pepkowitz and Everett R. Proud. *Analytical Chemistry*, v. 21, Aug. 1949, p. 1000-1003.

Previously abstracted from *U. S. Atomic Energy Commission*, AEC-D-2365. See item 10A-42, 1949.

**10A-122. Fortschritte der spektrochemischen Lokalanalyse.** (Advances in Spectrochemical "Spot" Analysis.) Paul Klinger and Otto Schliessmann. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 219-228.

New methods for determining inhomogeneities in metallic matrices. 14 ref.

**10A-123. Microsampling and Microanalysis of Metals.** Donald F. Clifton and Cyril Stanley Smith. *Review of Scientific Instruments*, v. 20, Aug. 1949, p. 583-586.

Design and use of a microshaper using a diamond tool to take linear cuts separated by as little as 0.02 mm. A hand-driven drill can be used for sampling circular areas of diameter greater than 0.1 mm. The chips, which may weigh as little as 0.1 microgram, are picked up on an electrified quartz fiber and centrifuged into a capillary which is evacuated and sealed for annealing. A precision X-ray diffraction photograph is then obtained from the annealed chip and the calculated lattice parameter used as an index of composition.

**10A-124. Industrial Spectroscopy; A Review of Modern Methods and Equipment.** D. M. Smith. *Metal Industry*, v. 75, Aug. 19, 1949, p. 149-150.

**10A-125. Semimicrochemical Method for Analysis of Blast-Furnace Slag.** (In Russian.) E. Ya. Shmulevich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 742-743.

Modified method, characterized by use of 0.2 g. samples, and in the case of determination of  $MnO_2$ , of 0.02 g.; and by substitution for potassium chlorate of ammonium persulfate in ammoniacal medium for oxidation of Mn.

**10A-126. Spectral Analysis of Metallic Coatings.** (In Russian.) K. I. Taganov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 695-700.

Describes simple method for the above and for spectroscopic determination of coating thicknesses.

**10A-127. Spektrochemische Analyse von Verunreinigungen an Metallen und Lösungen unter besonderer Berücksichtigung der in galvanischen Betrieben erforderlichen Untersuchungen.** (Spectrochemical Analysis of Impurities in Metals and Solutions, With Special Reference to Tests Required in Metal-Plating Plants.) H. Moritz. *Metallüberfläche*, v. 2, Nov. 1948, p. 237-245; Dec. 1948, p. 262-268.

Principles of spectrochemical analysis. Design and operation of the instruments required. Analytical methods are demonstrated by several specific examples. 23 ref.

**10A-128. (Book) Chemistry of Specific, Selective and Sensitive Reactions.** Fritz Feigl. 740 pages. 1949. Academic Press, 125 East 234th St., New York, N. Y. (Translated by Ralph E. Oesper.)

The mechanism of chemical reactions, the composition and constitution of reacting substances, and the products obtained, as well as the influence of reaction conditions. Relationship between solubility, color, fluorescence, etc., and constitution of compounds. 2184 ref.

**10A-129. (Book) R. T. B. Methods of Analysis.** 112 pages. Richard Thomas & Baldwins, Ltd., 47 Park St., London, W.1, England.

Part I covers ferrous; Part II non-ferrous metals; Part III deals with raw materials, such as ores, fluxes, refractories and slags; Part IV includes miscellaneous analysis such as water, pickle solutions, and tin coatings; Part V consists of tables.

## 10B—Ferrous

**10B-69. New Potentiometric Method for Determination of Manganese.** (In Russian.) N. A. Glebov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 609.

Method proposed by A. I. Busov. Experimental investigation indicates that this method enables ready determination of Mn contents of 0.1-95% in ferrous and nonferrous alloys without necessity for separation from Cr, Co, etc. Typical data for analysis of different types of steel.

**10B-70. Photocolorimetric Method of Determination of Nickel in Steel Without Complex Formation.** (In Russian.) A. I. Masurova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 610.

Method is briefly described.

**10B-71. Volumetric Determination of Small Amounts of Iron; Chromous Chloride as Reducing Agent.** William D. Cooke, Fred Hazel, and Wallace M. McNabb. *Analytical Chemistry*, v. 21, Aug. 1949, p. 1011.

Suitability for solutions containing 0.1-10 mg. of Fe.

**10B-72. A Method of Determining the Tin Content of Tungsten High Speed Tool Steel.** B. Bagshaw and E. Dyke. *Analyst*, v. 74, Apr. 1949, p. 249-252; discussion, p. 252-253.

Method involves separation of tungsten as the carbide from non-oxidizing acid media, removal of tin as the sulfide and its subsequent reduction to the bivalent state with metallic aluminum in presence of an antimony salt, and titration of the reduced tin with standard iodate solution.

**10B-73. Analysis of High-Speed Tool Steels by the Spekker Absorptiometer. Determination of the Major Alloying Constituents: Tungsten, Chromium, Vanadium, Cobalt and Molybdenum.** George J. Lennard. *Analyst*, v. 74, Apr. 1949, p. 253-257.

**10B-74. The Method Used in the Murex Laboratories for the Determination of Molybdenum in Ferro Molybdenum.** E. A. Chidley. *Murex Review*, v. 1, no. 4, 1949, p. 74.

**10B-75. Zur Strahlungsanalyse von flüssigem Stahl.** (Radiation Analysis of Molten Steel.) Gerhard Naeser and Gunther Engels. *Stahl und Eisen*, v. 69, July 21, 1949, p. 508-514.

Methods of improving the technique of analyzing steels by the radiations emitted from the molten metal. Effect of different alloying elements on radiation intensity and the relationship between radiation and steel quality. 16 ref.

## 10C—Nonferrous

**10C-117. Dosage du thorium dans le tungstène thorie par la mesure de sa radioactivité.** (Determination of Thorium in Thoriated Tungsten by Measurement of its Radioactivity.) M. Gallet. *Le Vide*, v. 4, March 1949, p. 585-590.

Laboratory experiments resulted in production of an apparatus for industrial use, particularly for the control of thoriated tungsten filaments used in incandescent lamps. Structural details and electrical circuit.

**10C-118. Potentiometric Determination of Manganese in Nonferrous Alloys.** (In Russian.) A. I. Busev and N. I.

Dmitrieva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 515-517.

Oxidation of bivalent Mn to the trivalent form by permanganate in neutral pyrophosphate solution. Applicability to various copper alloys and duralumin.

**10C-119. Etude de quelques propriétés physico-chimiques et analytiques du rhénium.** (Study of Certain Physicochemical and Analytical Properties of Rhenium.) S. Tribalat. *Annales de Chimie*, v. 4, May-June 1949, p. 289-351.

Results of an extensive study, with emphasis on the effects of different reducing agents on heptavalent Re compounds in HCl solution, and on qualitative determination of Re in the presence of high concentrations of Mo. 49 ref.

**10C-120. Colorimetric Determination; Variation of Young-Hall Method for Rapid Determining of Copper in Lead Base Alloys.** C. Goldberg. *Iron Age*, v. 164, Aug. 18, 1949, p. 88.

**10C-121. The Polarography of Cadmium. Scientific Apparatus and Methods.** Summer 1949, p. 72-76.

A review. 85 ref.

**10C-122. Assayer's Guide.** U. S. Atomic Energy Commission, AEC-D-2640, July 6, 1949, 77 pages.

Several methods for determination of U<sub>2</sub>O<sub>3</sub> in ores, for uranium in ores and metals, and for ThO<sub>2</sub> in ores.

**10C-123. Utilization of Waste Slag in Gold Assaying.** L. A. Goedbloed. *Canadian Mining Journal*, v. 70, Aug. 1949, p. 81-82.

Cost savings. Recommended procedures.

**10C-124. Quantitative Spectrochemical Determination of Lead and Zinc in Ores.** Isidore Schnopper and Isidore Adler. *Analytical Chemistry*, v. 21, Aug. 1949, p. 939-940.

Method applicable to determination of 0.05-6% Pb and 0.05-6% Zn in Sb, Sn, and Cu ores. A statistical study of results as compared with those obtained by chemical analysis indicates no significant difference.

**10C-125. Iodometric Determination of Copper; Effect of Thiocyanate on End Point and Use of Sulfate-Hydrogen Sulfate Buffers.** Edward W. Hammock and Ernest H. Swift. *Analytical Chemistry*, v. 21, Aug. 1949, p. 975-980.

20 references.

**10C-126. Routine Determination of Nickel in Cobalt-Base Alloys; Ferricyanide Oxidation of Cobalt.** Louis Silverman and Herman K. Lembersky. *Analytical Chemistry*, v. 21, Aug. 1949, p. 983-984.

In ammoniacal solution, cobaltous salts are oxidized to the trivalent form by ferricyanide, and nickel is subsequently precipitated by dimethylglyoxime in acetate buffered solution. One part N may be detected in the presence of 200 parts Co. W, Mo, Cr, Fe, Mn, Pb, and Ti do not interfere, hence no special separations are needed.

**10C-127. Isoquinoline as a Reagent in Inorganic Analysis.** Adolph E. Spakowski and Henry Freiser. *Analytical Chemistry*, v. 21, Aug. 1949, p. 986-989.

Some general aspects of the nature of the reaction between isoquinoline, the thiocyanate ion, and certain divalent cations. The reagent was applied to the determination of Cu in alloys and in ores with an accuracy of 3-4 parts per thousand in brasses, and 10-13 in the ores. Also provides a means for separation of Cu and Zn in brass with an average accuracy of  $\pm 0.2$  mg. 12 ref.

**10C-128. Separation of Bismuth and Lead.** (In Russian.) S. I. Busev. *Uspekhi Khimii* (Progress in Chemistry), v. 18, May-June 1949, p. 347-359. On the basis of existing bibliographic data, it appears that simple

rapid methods for such separation do not exist. Possibility of determination by potentiometric methods. 78 ref.

**10C-129. Synthetic Standards for Spectral Analysis.** (In Russian.) E. S. Kudelya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 691-695.

Preparation of suitable standards by means of mixing and press forming of the desired metallic powders. Preparation of standards for determination of Mn and Al.

**10C-130. Spectral Analysis of Metallic Lead.** (In Russian.) A. I. Alekseeva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 700-703.

Method of determination of Bi, Sb, Sn, Cu, Zn, and Ag in Pb. which has recently been applied for control of the purification process in commercial lead production. Method of evaluating data. Results of typical determinations.

**10C-131. Neue Vorschriften zur quantitativen Analyse durch innere Elektrolyse.** (New Directions for Quantitative Analysis by Internal Electrolysis.) A. Schleicher. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, July 1949, p. 210-212.

New apparatus and directions for precipitation of Cu, Ni, Co, Sn, and Pb and for the separation of Cu from Cu pyrites, brass, bronze, and nickel silver.

**10C-132. Eine Methode zur Wolframbestimmung.** (A Method of Determining Tungsten.) Herbert Brintzinger, Fritz Rausch, and Martin Backhausen. *Zeitschrift für anorganische Chemie*, v. 255, Mar. 1948, p. 323-324.

The tungsten content of ores, slags, etc., can be quantitatively determined by dissolving them in Na<sub>2</sub>S (Na<sub>2</sub>SO<sub>3</sub> in a reducing atmosphere), followed by precipitation of tungstic acid.

## 10D—Light Metals

**10D-29. The Polarographic Analysis of Light Metals and Alloys: a Survey.** W. Stross. *Analyst*, v. 74, May 1949, p. 285-292.

Alkali, alkaline-earth, and rare-earth metals; Mg, Al, and Be. 40 ref.

**10D-30. The Quantitative Separation of Beryllium From Aluminium.** W. C. Coppins. *Analyst*, v. 74, May 1949, p. 317-318; discussion p. 318.

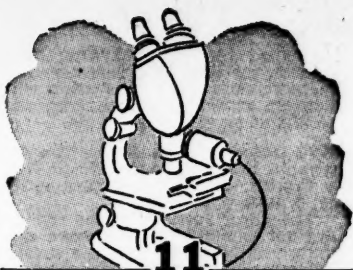
When a caustic alkaline solution of Be and Al is neutralized with dilute acid, the Be(OH)<sub>2</sub> starts to precipitate first, and on subsequent boiling, precipitation of beryllia is quantitative while Al remains in solution. Indigo carmine may be used as indicator to show the correct alkalinity. With a large excess of Al double precipitation is necessary.

**10D-31. A Rapid Method for Estimating the Hydrogen Content of Wrought Aluminium Alloys.** A. J. Swain. *Journal of the Institute of Metals*, v. 75, July 1949, p. 863-868.

A quantitative correlation was found between the voids formed in specimens of 7% Mg Al-alloy sheet when immersed in molten potassium dichromate at 580° C. for 10 min., and the hydrogen content determined by the vacuum-extraction method. This forms the basis of a simple and rapid method for estimating the hydrogen content of the wrought alloy to an accuracy, in the range investigated, of approximately  $\pm 0.10$  cc. in 100 g.

**10D-32. Au sujet du dosage de l'alumine dans l'aluminium et ses alliages.** (Determination of Alumina in Aluminium and Its Alloys.) M. Tournaire. *Revue de Métallurgie*, v. 46, May 1949, p. 294-296.

Comparatively analyzes three methods. The wet method is the simplest and will give good results if carefully performed.



## APPARATUS, INSTRUMENTS and METHODS

**11-258. Contribution à l'étude de la dilatation à haute température** (Contribution to the Study of Expansion at High Temperature.) J. Pierrey. *Annales de Chimie*, v. 4, Mar.-Apr. 1949, p. 133-194.

An optical dilatometer suitable for use up to 2500° C. Using this apparatus, the coefficient of expansion of graphite was determined at 2300° C. along two axes of the crystal. The minimum percentage of refractory oxides necessary for stabilizing zirconium oxide was determined. The addition of very small quantities of CaO and MgO not only causes the ZrO<sub>2</sub> transformation point at 1100° C. to disappear, but causes this compound to be stable up to 2000° C. (from the dilatometric point of view). 58 ref.

**11-259. The Calculation of the "Ideal" Resistance of Metals at Low Temperatures.** (In English.) G. J. Van Den Berg. *Physica*, v. 15, Apr. 1949, p. 65-70.

Analyzes the above problem. 23 ref.

**11-260. High Temperature X-Ray Camera.** (In English.) H. L. Johnston. *Physica*, v. 15, Apr. 1949, p. 189-190.

Camera capable of use at temperatures up to 3000° K. with which successful X-ray diffraction patterns of Mo and Ta have been obtained at 2600° K.

**11-261. Graphical Determination of Critical Points in Steel From Differential Dilatometric Curves.** (In Russian.) A. N. Chervyakov and R. M. Rozenblyum. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 610-612.

**11-262. Apparatus for Determination of Stresses During Different Types of Action of Tools.** (In Russian.) N. P. Bezklubenko. *Zavodskaya Laboratoriya*, (Factory Laboratory), v. 15, May 1949, p. 616-618.

Its application to rolling-mill passes applied to sheet and tubes.

**11-263. The Physical Limits of Some Measuring Processes.** (Continued.) A. Mottu. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 98-111. Translated from the French.

Reversible microscopes for the comparison of standard scales and their accuracy. Profile projectors and surface-quality testing.

**11-264. The Appreciation of the Various States of a Surface by the Method of Total Reflection.** Armand De Gramont. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 118-120. Translated from the French.

Describes apparatus and procedures for determining by comparison whether machining meets certain requirements and conditions.

**11-265. Metals in Instruments. A Metallurgical Survey of the Materials Used.** E. H. Bucknall. *Journal of the Birmingham Metallurgical Society*, v.

29, June 1949, p. 55-80; discussion p. 81-84.

Previously abstracted from *Metal Industry*, item 3A-85, 1949.

**11-266. Sur deux variantes de la méthode de Laue et leurs applications.** (Two Variations of Laue's Method and Their Applications.) A. Guinier and J. Tennevin. *Acta Crystallographica*, v. 2, June 1949, p. 133-138.

A geometrical property of white X-radiation from a point source and reflected in a given family of crystal planes makes it possible to obtain photographs from which the scatter of the normals to these planes may be determined with an accuracy of 10 seconds of arc, even in a relatively large crystal. In this way, the degree of perfection of certain crystals was determined and a new type of imperfection discovered. An alternative arrangement gives an image of the crystal from which its position and orientation and the position of a region of imperfection can be determined. 12 ref.

**11-267. Modern Optical Methods for Examination of Metals.** H. Lloyd. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 116-120.

Proceedings of recent British Iron and Steel Research Assoc. meeting.

**11-268. An X-Ray Method for Studying Rapid Phase Changes in Steels at High Temperatures.** H. T. Heal and J. Savage. *Nature*, v. 164, July 16, 1949, p. 105.

Method which is believed to provide more accurate results than the usual method of study at room temperature after quenching.

**11-269. Strain Gages for Measurement and Control of Displacement.** *Product Engineering*, v. 20, Aug. 1949, p. 136-137. Condensed from "Bonded Resistance Wire Strain Gages as Components of Machinery and Gaging Equipment", by George N. Levesque. Four gages are connected in a Wheatstone bridge circuit and the output passed through an electronic amplifier and indicator.

**11-270. (Book) The Principles of Metallographic Laboratory Practice.** Ed. 3. George L. Kehl. 520 pages. 1949. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. \$5.50.

New edition retains the purpose of previous editions in presenting the fundamental principles of metallographic laboratory practice in a treatment that bridges the gap between theoretical physical metallurgy and its practical application in the laboratory. Thoroughly revised and rewritten to include the latest developments.

**11-271. (Book) Checking and Measuring Surface Forms.** (In German.) Johannes Perthen. (Karl Burger, editor.) 257 pages. 1949. Carl Hanser, Munich 27, Germany.

This is Vol. III of a set on technical measuring. The various methods and instruments. (From review in *Product Engineering*, v. 20, Aug. 1949.)

**11-272. (Book) Crystals and X-Rays.** K. Lonsdale. 199 pages. 1948. G. Bell & Sons, Ltd., York House, 6 Portugal St., Lincoln's Inn Fields, London, W.C.2, England.

Possibilities of X-ray crystallographic methods. Generation and properties of X-rays; geometry of crystals, X-ray methods of investigation; geometrical structure determination; determination of atomic and electronic distribution; extrastructural studies; and the importance of the study of crystals.

**11-273. (Book) A Dictionary of Metallography.** Ed. 2. R. T. Rolfe. 287 pages. Chapman & Hall, Ltd., 37 Essex St., London, W.C.2, England. 18s.

- In the present edition, 152 new terms have been added and two deleted, making a new total of 1,350 terms. In addition 250 terms have been extensively revised. Recommended wholeheartedly, especially to students and younger metallurgists. (From review in *Welding*, v. 17, July 1949.)
- 11-274. A New Method for Surface Reproduction.** K. B. Mather. *Metal Progress*, v. 56, Aug. 1949, p. 225-227.  
If a reasonably flat metal surface is pressed into a fine-grained photographic emulsion at about 15,000 psi, and the plate developed and examined under a microscope, a pattern is found that reproduces the surface contours. A pronounced three-dimensional appearance results. If standardized, it is believed that the method might give a quantitative measure of surface roughness.
- 11-275. Electroradiography.** J. J. Trillat. *Metal Progress*, v. 56, Aug. 1949, p. 256, 258. Translated and condensed.  
Previously abstracted from *Revue de Metallurgie*, item 11-212, 1949.
- 11-276. Single-Crystal Patterns in Electron Diffraction.** H. Wilman. *Research*, v. 2, Aug. 1949, p. 352-362.  
An illustrated review. 76 ref.
- 11-277. An Optical Device Facilitating Accurate Alinement.** R. H. Brockman. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, July 1949, p. 231-233.  
Application to a universal milling machine. Other potential applications.
- 11-278. The Precision Determination of Lattice Constants by the Powder and Rotating Crystal Methods and Applications.** M. E. Straumanis. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 726-734.  
A method of very high precision (in some cases more than 1:200,000, even with crystals of lower symmetry). The method tries to eliminate the errors of the Debye-Scherrer-Hull and rotating crystal methods by careful experimental technique. The films obtained are very clear, especially in the important back-reflection region. No standard substances are necessary and absorption corrections are negligible. Several applications. 54 ref.
- 11-279. Dead Time and Non-Linearity Characteristics of the Geiger-Counter X-Ray Spectrometer.** Leroy Alexander, Elizabeth Kummer, and Harold P. Klug. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 735-740.  
Satisfactory use of Geiger-counter methods for measurement of diffracted X-ray intensities demands that observed counting rates be corrected for the nonlinear response of the counter. Both the multiple-foil method calibrating nonlinearity of response and the two-source method of Beers for measuring counter dead time were found to be unsatisfactory. Electronically controlled oscillographic techniques were much more satisfactory.
- 11-280. Reflection Method of Determining Preferred Orientation on the Geiger-Counter Spectrometer.** Michael Field and M. Eugene Merchant. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 741-745.  
Rapid and accurate method especially valuable for dealing with thin layers on thick specimens.
- 11-281. An Improvement in the Shadow-Cast Replica Technique.** S. J. Singer and R. F. Petzold. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 816-817.  
Use of ethyl cellulose instead of "parlodion" for stripping metal replicas.
- 11-282. Neutron Diffraction by Crystals.** Kathleen Lonsdale. *Nature*, v. 164, Aug. 6, 1949, p. 205-209.  
Properties of neutrons; their sources, methods of observation and measurement; their interaction with matter; experimental methods; and results of experiments. 24 ref.
- 11-283. Interpretation of Electron Micrographs Prepared by the Plastic Replica Process.** J. Trotter. *Nature*, v. 164, Aug. 6, 1949, p. 227-228.  
The upper surfaces of the replicas are not perfectly flat but have contours related to that of the surface being examined. By deposition in vacuum of a film of heavy metal on the surface of the replica, the disturbing influence of the nonplanar surface is eliminated. Results of a study of this surface by deposition of Cr before stripping from the base metal.
- 11-284. Optical Micrography.** Jean Ternisien. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 134-139. Translated from the French.  
Methods used in connection with the compound microscope for the study of thin transparent bodies and of opaque bodies (refractory oxides and metal alloys). (To be continued.)
- 11-285. Sur la mesure des dimensions des particules d'oxyde de zinc.** (Determination of the Size of Zinc Oxide Particles.) L. Habraken. *Revue de Metallurgie*, v. 46, Apr. 1949, p. 228-232.  
Four different methods are optical and electron microscopy, turbidimetric analysis, and X-ray study. All four methods furnish quite concordant data, the direct method having the advantage of producing, in addition, mean values of particle size, thus indicating morphology of the particles. 32 ref.
- 11-286. Über die Mehrdeutigkeit der Kristallstrukturbestimmung.** (Concerning the Ambiguity of Determination of Crystal Structures.) Georg Menzer. *Zeitschrift für Naturforschung*, v. 4a, Apr. 1949, p. 11-21.  
The X-ray method does not always give accurate results. Criteria for several possible structures of a given reflex intensity and for the atomic arrangements of these structures. Tabulated data and mathematical formulas indicate methods of calculation and results.
- 11-287. Die Entwicklung eines Gerätes zum elektrolytischen Polieren (Glänzen) von Metallographischen Schliffen im Industrielaboratorium.** (Development of an Apparatus for Electropolishing of Metallographic Samples in the Industrial Laboratory.) W. Engelhardt and R. Neuf. *Archiv für Metallkunde*, v. 3, May 1949, p. 180-185.  
Design and operation of the above, and results for different metals.
- 11-288. Beiträge zur metallographischen Korngrößenmessung. I. Zur Messtechnik der Korngrößenmessungen.** (Contributions to the Metallographic Determination of Grain Sizes. I. The Technique of Measuring Grain Sizes.) H. Kostron. *Archiv für Metallkunde*, v. 3, June 1949, p. 193-203.  
The purpose, problems, and different methods. 29 ref.
- 11-289. Light Figures of Single Crystals of Zinc. Part I. Light Figures of Zinc Single Crystals Etched with Acids or Alkalies.** (In Japanese.) Mikio Yamamoto and Jiro Watsnabe. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 1-5.  
Light figures produced by the three principal crystallographic planes etched for different time-intervals with various acids or alkalies, were observed and the suitabilities of the figures for determination of crystal orientation were examined.
- 11-290. New Worlds for Study.** James Hillier. *Scientific Monthly*, v. 69, Sept. 1949, p. 161-168.  
Various applications of electron microscopy to research in biology, metallurgy, and geology.
- 11-291. Application of Electronics in the Iron and Steel Industry.** W. M. McKie and D. A. Lamont. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 59-67.  
Circuit diagrams for various pieces of electronic equipment for the above, including motor control and power conversion, X-ray thickness gage, pinhole detector, current totalizer, and rotating regulator amplifier.
- 11-292. The Magnetic Sorting Bridge.** L. F. Bates and N. C. Underwood. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Aug. 1949, p. 276.  
Results of an extended series of measurements of the fundamental behavior of the above instrument, made under sponsorship of British Iron and Steel Research Association. Comparative magnetization curves for steel specimens of different carbon contents. Effects of Mn and Si contents on the cathode-ray pattern.
- 11-293. Sample Scanning Mechanism for X-Ray Diffraction.** J. W. Hickman and A. G. Kleinknecht. *Review of Scientific Instruments*, v. 20, Aug. 1949, p. 573-574.  
An automatic scanning mechanism for study of preferred orientations in worked materials for pole-figure representation.
- 11-294. Design of Equipment for Thermal Studies.** Robert J. Teitel. *Review of Scientific Instruments*, v. 20, Aug. 1949, p. 575-578.  
Versatile metallurgical furnace for high-temperature investigations of metals and alloys. Use to conduct thermal analysis and thermal treatments on Be-Fe alloys. A special thermal crucible was designed.
- 11-295. Operational Features of a New Electron Diffraction Unit.** Robert G. Picard, Perry C. Smith, and John H. Reiser. *Review of Scientific Instruments*, v. 20, Aug. 1949, p. 601-611.  
A new unit having a three-lens optical system and a maximum effective specimen-to-plate distance of 200 cm. Applications of such a system to the study of long interatomic spacings. Use of the unit as a shadow microscope. 11 ref.
- 11-296. Modified SR-4 Indicator To Measure Dynamic Strains.** B. B. Hammer and H. Sommer. *Product Engineering*, v. 20, Sept. 1949, p. 143-145.  
Modified indicator used in conjunction with a cathode-ray oscilloscope for a simple, inexpensive method of measuring dynamic strains.
- 11-297. Indium Replica for Metallurgical Examination.** E. B. Roth. *U. S. Atomic Energy Commission, AECD-2461*, Nov. 15, 1948, 10 pages.  
Technique especially suitable for making replicas behind radioactive shielding in a "hot" laboratory.
- 11-298. Etchants for Microexamination of Cast Magnesium Alloys.** *Foundry*, v. 77, Sept. 1949, p. 135.  
Table gives compositions, etching procedures, characteristics, and uses for 10 etchants.
- 11-299. Changes in Solids Bombarded by Electrons in the Electron Microscope.** (In Russian.) A. I. Echeistova and A. B. Shakhter. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 238-241.  
Changes of structure (consolidation of particles and filling up pores) of finely dispersed solid bodies during electron-microscope examination were studied. Shows that the coating does not consist of metallic atoms

but is a layer of carbon or carbon-containing substance.

**11-300. Méthode d'étude des métaux à l'aide des perméamètres à enroulements démontables.** (Method of Study of Metals Using Permeability Meters With Interchangeable Coils.) I. Epelboin, A. Marais, and P. Pannetier. *Revue de Métallurgie*, v. 46, May 1949, p. 315-318. A newly developed instrument for the study of magnetic properties over a wide range. Method of operation.

**11-301. Remarques sur les procédés physiques et mécaniques de contrôle des produits en alliages légers en cours et en fin de fabrication.** (Remarks Concerning Physical and Mechanical Methods for Control of Light-Alloy Products During Their Production and After Their Completion.) M. Renouard. *Revue de Métallurgie*, v. 46, June 1949, p. 345-353. Macrographic, micrographic, spectrographic, and X-ray investigation methods, and application to individual steps of production.

**11-302. Nouvelle méthode de précision pour la mesure de la maille individuelle des grains.** Application à l'étude de l'écrouissage et de la recristallisation. (A New Method for Determination of Size of Individual Grains. Application to the Study of Strain Hardening and Recrystallization.) C. Crussard and F. Aubertin. *Revue de Métallurgie*, v. 46, June 1949, p. 354-359; discussion, p. 359. The proposed method permits determination of grain size with an accuracy of 0.00002. By a variation of the method, determination of the size of individual grains is possible. Application of this method to the study of strain hardening and recrystallization reveals that true grain size is different from average grain size determined by standard methods. Difference depends on cold working and heat treatment variables.

**11-303. La microradiographie.** Application à l'étude des alliages légers. (Microradiography. Its Application in the Study of Light Alloys.) Fernand Fournier. *Revue de Métallurgie*, v. 46, June 1949, p. 360-362; discussion, p. 362. A newly developed apparatus for investigation by X-ray diffraction of minute amounts of material. Method of investigation.

**11-304. Zur Frage der Verschleierung des Bildes in der Aufsicht-Mikroskopie.** (The Problem of Blurred Images in Reflected-Light Microscopy.) H. Klemm. *Archiv für Metallkunde*, v. 3, June 1949, p. 221-223. Function of the aperture and field diaphragms and the blurring effect caused by an excessive amount of light and by reflection of light from the objective. A method of correcting this effect.

**11-305. Erfahrungen bei der Anwendung der Elektronenbeugung zur Untersuchung fester Körper.** (Experiences in the Use of Electron Diffraction for Investigation of Solids.) R. Forster and E. Brandenberger. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, July 1949, p. 215-224. Electron rays are superior to X-rays in the study of thin films and crystal surfaces, characterization of fine crystalline and amorphous substances. 10 ref.

**11-306. Ein einfaches Verfahren zur Messung der Viskosität bei hohen Temperaturen.** (A Simple Method for Measuring Viscosity at Elevated Temperatures.) Adolf Knappwost. *Zeitschrift für Metallkunde*, v. 39, Oct. 1948, p. 314-318. Method especially suitable for molten metals. Theoretical basis of the method and experimental verification.

**11-307. Über einen Weg zur Bestimmung der absoluten Oberfläche von unedlen Metallen.** (A Method for Determining the Absolute Surface of Base Metals.) Otto Erbacher, Gisela Jensen-

Hellmann, and Auguste Mellin. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 249-255.

The method is based on a simple electrochemical ionic exchange in which lead nitrate-thorium B dissolved in a noncorrosive solvent is adsorbed on the ground and polished surfaces of the base metals. The experimental procedure and typical results. 11 ref.

**11-308. Über die elektronenmikroskopische Darstellung von feinen, lockeren Fremdschichten auf Oberflächen.** (An Electron-Microscopic Method of Investigating Smooth, Porous Surface Films of Foreign Matter.) Robert Seeliger. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 255-256. Two electron micrographs of dur-

alumin are shown and discussed.

**11-309. The Isolation of Carbides From High Speed Steel.** D. J. Blickwed and Morris Cohen. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 578-584. Development of an electrolytic extraction technique for quantitatively isolating the carbides from both annealed and hardened high speed steel. Particular attention is paid to amount, as well as composition, of the carbides. Illustrative results are given for M-2 grade W-Mo steel. 25 ref.

**11-310. Rapid Polish With Diamond Hand Hone.** L. P. Tarasov. *Industrial Diamond Review*, new ser., v. 9, Aug. 1949, p. 231, 254. Use for polishing metallographic specimens.

**11-311. Sur l'utilisation du champ magnétique et du microscope polarisant pour l'identification des micro-cristaux.** (Concerning Utilization of a Magnetic Field and a Polarizing Microscope for Identification of Micro-Crystals.) Aimé Cotton. *Comptes Rendus* (France), v. 228, June 8, 1949, p. 1775-1777. Simple technique.

**11-312. Sur la mesure de la perméabilité magnétique en ultra-haute fréquence.** (Concerning Measurement of Magnetic Permeability at Ultra-High Frequencies.) Pierre Grivet. *Comptes Rendus* (France), v. 228, June 8, 1949, p. 1796-1799. Method in which the metal being studied forms the central wire of a coaxial conductor. Results for ferromagnetic at 3-cm. wavelength agree qualitatively with theory.

**11-313. Mesure de la constante gyromagnétique du fer et du nickel.** (Measurement of the Gyromagnetic Constants of Iron and Nickel.) André J. P. Meyer. *Comptes Rendus* (France), v. 228, June 20, 1949, p. 1934-1935. Characterized by evaluation of the degree of influence of the Doppler-Fizeau effect on the spectral bands. Formula for computation of obtained data and its graphic interpretation.

**11-314. Sur une méthode expérimentale d'étude de la température réellement atteinte au cours du meulage dans les couches superficielles d'un échantillon métallique: Cas du cobalt.** (Concerning an Experimental Method for Study of True Temperature Attained During Surface Grinding of a Metallic Specimen: The Case of Cobalt.) Robert Courtel. *Comptes Rendus* (France), v. 228, June 27, 1949, p. 2031-2033. A method in which the metal is ground in vacuum, with electron-diffraction control and recording. Factors involved and difficulties encountered in the case of cobalt.

**11-315. Beiträge zur metallographischen Korngrößenmessung. II. Zwei neue Schnellverfahren zur Kornquerschnittsbestimmung.** (Metallographic Methods for Measuring Grain Sizes. II. Two New Rapid Methods for Determining Grain Sizes.) H. Kostron. *Archiv für Metallkunde*, v. 3, July 1949, p. 229-242.

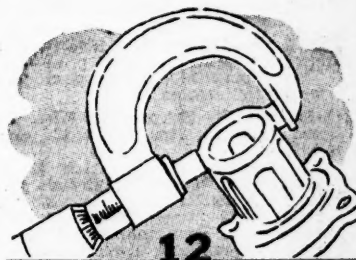
The photographic and the "rectangular" processes and comparison with the ASTM grain-sizing scale. The relation between the grain size of a metal and its properties.

**11-316. (Book) X-Ray Optics; The Diffraction of X-Rays by Finite and Imperfect Crystals.** A. J. C. Wilson. 127 pages. 1949. Methuen & Co., Ltd., London, England.

One of a series of monographs intended for readers of average scientific attainment. The necessary mathematics is introduced gradually, the earlier chapters requiring little more than elementary trigonometry.

For additional annotations indexed in other sections, see: 3A-165; 3B-177; 4A-104; 6A-102-105

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**12-167. X-Ray Gaging of Flat Rolled Steel.** D. I. Brown. *Iron Age*, v. 164, Aug. 18, 1949, p. 101-104.

Experiences in use of the X-ray gage in two midwest mills.

**12-168. Aluminum Condenser and Heat Exchanger Tubes.** J. S. Hamilton and J. J. Bowman. *ASTM Bulletin*, July 1949, p. 44.

Information about these materials which may help to evaluate their usefulness. (Supplementary to ASTM specification B234-48T.)

**12-169. The Consumer Views Rough Casting Inspection.** U. S. Sullivan. *American Foundryman*, v. 16, Aug. 1949, p. 56-58.

Methods and equipment.

**12-170. Steel Specifications From the Consumer's Standpoint.** Muir L. Frey. *Steel*, v. 125, Aug. 29, 1949, p. 60-63, 88.

Reviews AISI and SAE quality specifications. Suggests several refinements.

**12-171. Industrial Radiography: Protective Equipment for the Handling of Radium Sources.** *Metal Industry*, v. 75, Aug. 5, 1949, p. 109-110.

**12-172. Stereoscopic Radiography.** F. Hargreaves. *Engineer*, v. 188, Aug. 5, 1949, p. 154-155.

Technique applied to welding in locomotive construction and repair.

**12-173. Steel Products Manual.** Sec. 19. *Railway Track Materials*. Sec. 21. *Concrete Reinforcing Bars*. Sec. 23. *Tolerances for Alloy Steel Sheets and Strip*. Sec. 26. *Flat Rolled Electrical Steel*. Sec. 27. *Rail Steel*. *American Iron and Steel Institute*, 1949; 121, 48, 10, 100, and 12 pages.

Five booklets of a series. Standard grades, identification, testing, analyses, manufacturing procedures, metallurgical aspects, quality control, specifications.

**12-174. Detection of Incipient Drill Pipe Failures.** Walter C. Main. *Petroleum Engineer*, v. 21, Aug. 1949, p. B36, B38, B40, B42, B45-B46, B48, B50, B52, B54.

Previously abstracted from *Drilling*. See item 12-109, 1949.

**12-175. Tolerances of Finished Metal Powder Parts.** William R. Toeplitz. *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 36-48; discussion, p. 48-50.

Diagrams of typical parts show that designers often specify ultra-precise tolerances for powdered metal parts, because they do not realize the true economic limits of such precision. Recommends more work on standardization of dimensional tolerance.

**12-176. How Pennsylvania Railroad Uses X-Ray Inspection.** David Goodman. *Iron Age*, v. 164, Sept. 1, 1949, p. 80-83.

Use of mobile 250,000-volt X-ray unit for checking pilot models of new and replacement parts, inspecting used parts, and checking quality of purchased parts.

**12-177. Quality Control. Welder, v. 18 (new ser.).** Apr.-June 1949, p. 35-38. As applied to the manufacture of welding electrodes.

**12-178. Quality Extras—and Why.** Rebecca H. Smith. *Iron Age*, v. 164, Sept. 8, 1949, p. 75-77.

More realistic approach to the problems of "quality" materials, particularly concerning acceptable defects, could greatly decrease present extra costs. Problems posed by Magnafux, X-ray, and ultrasonic inspection methods.

**12-179. Checking "Split Thousandths" by Optical Projection Gaging Simplifies Production Control and Reduces Inspection Time.** *Steel*, v. 125, Sept. 12, 1949, p. 110-112.

Comparator in combination with staging fixture designed for inspection within critical tolerances of 0.0001 in. Simplifies production control and reduces inspection time on watch and automobile parts, turbine blades, chains, etc.

**12-180. Etude d'anomalies de réflexion et de transmission se produisant lors du sondage par les ultra-sons des métaux.** (Study of Anomalies of Reflection and Transmission Occurring During Ultrasonic Testing of Metals.) P. Bastien, J. Bleton, and E. de Kervsau. *Revue de Métallurgie*, v. 46, May 1949, p. 277-286.

Such anomalies are caused by the presence of metal crystals the mean diameter of which equals a multiple of half the wave-length of the ultrasonic impulse. In the case of reflection, the effect is readily distinguishable from those resulting from defects, but this is not the case for transmission.

**12-181. Control and Inspection of Heat Treated Parts. Part I.** Howard E. Boyer. *Steel Processing*, v. 35, Aug. 1949, p. 418-423.

Selection of inspection methods which will reveal the most information directly related to the end use of the raw material. Various common test methods and importance of temperature control. (To be continued.)

**12-182. Round Table Discussion on Ultrasonic Testing.** *American Society for Testing Materials*, 23 pages.

Transcript of discussion held at the 51st annual meeting of the ASTM, Detroit, June 21, 1948.

**12-183. (Book) Metals and Alloys.** Ed. 5, rev. 214 pages. 1949. Iliffe and Sons,

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Ltd., Dorset House, Stamford St., London, S. E. 1, England. \$4.00.

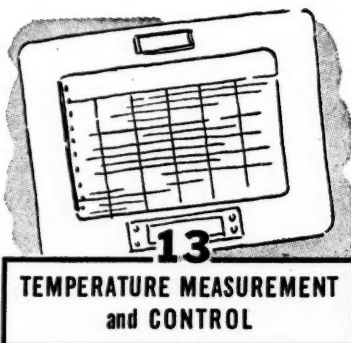
Covers about 4600 compositions, compared to a total of 3700 in the previous edition, and represents a complete revision. Specifications are listed in chart form for alloys usually regarded as nonferrous and are limited to those containing not more than 50% Fe.

**12-184. (Book) British Standards for Steel and Steel Products.** 674 pages. 1949. British Standards Institution, 28 Victoria St., London, S.W.1, England. 25s.

Consists of a number of descriptive articles on principles of steel-making, casting, and forging; use of steel for metalworking and chemical plants; blooms, billets, slabs, and sheet bars and their qualities, chemical compositions, and purposes; British standards for the heavy industries; application of steel processes for pressure vessels, gas cylinders, and galvanizing.

**12-185. (Book) A.S.T.M. Standards on Light Metals and Alloys: Aluminum and Aluminum Alloys, Cast and Wrought; Magnesium and Magnesium Alloys, Cast and Wrought; Methods of Testing Light Metals.** 150 pages. Feb. 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

A compilation of specifications and test methods.



TEMPERATURE MEASUREMENT and CONTROL

**13-53. Gas Temperature Measurement Above 1500° C.** R. Mayorcas. *Journal of the Institute of Fuel*, v. 22, June 1949, p. 251-255.

Where determination of the gas temperature as such is essential, the suction pyrometer can be modified to permit measurements up to 2000° C. For many thermal-efficiency calculations in connection with high-temperature processes, however, the real requirement is direct measurement either of heat transfer or of the heat content of the gases involved. The first can be made with the heat-flow meter recently developed in England, and the second by continuous gas calorimetry with the sensible-heat meter. 20 ref.

**13-54. The Use of Semi-Conducting Ceramic Glazes for the Measurement of Temperature.** J. S. Forrest. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, July 1949, p. 254-255.

A method for measuring moderate temperature by means of the resistance of a small porcelain element glazed with a semiconducting ceramic material. Calibration curve of a typical element from 0 to 160° C.

**13-55. Welder for Attaching Fine Wires to Massive Metal Bodies.** W. J. Trott. *Review of Scientific Instruments*, v. 20, Aug. 1949, p. 624-625.

Purpose is to secure good thermo-

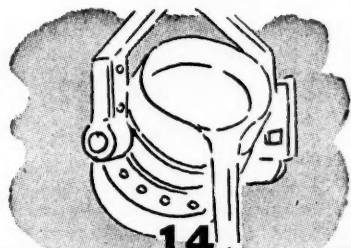
couple junctions for measurement of surface temperatures.

**13-56. Advantages of Resistance Thermometers.** Paul G. Weiller. *Electrical Manufacturing*, v. 4, Sept. 1949, p. 104-107, 204.

Recent development of suitable amplifying means widens uses for this method as a built-in control. Circuit diagrams and illustrations of commercial instruments.

**13-57. Oberflächenmessung der Temperatur. Berechnung der Wärmeströmung in das Thermometer.** (Measuring Surface Temperature. Computing the Heat Flow into the Thermometer.) Franz Moeller. *Archiv für Technisches Messen*, July 1949, p. T53-T54 (4 p.).

Inaccuracies in surface-temperature measurements are caused by heat gains or losses and by heat-flow resistances. Formulas for computing the necessary correction factors.



FOUNDRY PRACTICE

#### 14A—General

**14A-111. Electric Ingot Process Saves Strategic Alloys.** E. S. Kopecki. *Iron Age*, v. 164, Aug. 18, 1949, p. 81-87.

Application to the manufacture of high-temperature alloys results in a considerable saving of virgin elements, when compared with current melting practice. Results of a study of relative consumption of Cr, Ni and Mo in the manufacture of 16-25-6 alloy. Significant features of the new six-mold production machine.

**14A-112. An Approach to New Developments in Casting Control.** H. H. Harris. *Metal Progress*, v. 56, Aug. 1949, p. 222-224.

The Navy began a research program in June 1947 at Alloy Engineering & Casting Co.'s plant in Champaign, Ill., directed toward experimental production of intricate and highly accurate parts for high-temperature service. Fundamental considerations involved and fruitful lines of inquiry decided upon on the basis of these considerations.

**14A-113. Moisture in Bentonite Influences Strength.** Bradley H. Booth. *American Foundryman*, v. 16, Aug. 1949, p. 50-51.

Investigated for four different bentonites.

**14A-114. Evolution of Investment Casting.** *Industrial Heating*, v. 16, Aug. 1949, p. 1378. Condensed from paper by Albert W. Merrick.

See abstract from *Metal Progress*, item 14A-99, 1949.

**14A-115. Sand Core Baking by Dielectric Heating.** Ben Griffith. *Western Metals*, v. 7, Aug. 1949, p. 26-29.

**14A-116. Experiences with Ethyl Silicate in the Foundry.** F. B. Tedds. *Engineering*, v. 168, July 29, 1949, p. 101-102. A condensation.

See abstract from *Metal Industry*, item 14A-106, 1949.

**14A-117. Moulages par noyaux extérieurs résistants et très perméables.** (Casting in Molds With Extremely

Permeable Cores but Tough External Surfaces.) Pierre Nicolas. *Fonderie*, May 1949, p. 1589-1591.

Two types of molds having the above properties are cement-sand and silicate-sand. Chemical compositions and methods of production, as well as recommended casting methods.

14A-118. Modelle, Modellplatten und Kernkasten aus Aluminiumgusslegierungen. (Patterns, Pattern Plates, and Core Boxes for Cast Aluminum Alloys.) H. Reininger. *Die Neue Giesserei*, v. 36 (new ser., v. 2), July 1949, p. 199-204. Arguments for replacing wood by Al alloys for patterns and core boxes. 12 ref.

14A-119. Casting Surface Finish. H. H. Fairfield and J. MacConachie. *Canadian Metals and Metallurgical Industries*, v. 12, Aug. 1949, p. 18-19, 32, 34.

Previously abstracted from *American Foundrymen's Society*, Preprint 24, 1949. See item 14A-53, 1949.

14A-120. Which Comes First—Core Oil or Water? O. J. Myers. *Foundry*, v. 77, Sept. 1949, p. 75, 190.

Influence on core-sand properties of variations in both the order in which different ingredients are added to the mix, and the total mixing time.

14A-121. Care of Molding Machines. Raymond Shire. *Foundry*, v. 77, Sept. 1949, p. 89, 148, 150.

Points to be observed in the proper maintenance of molding machines.

14A-122. Silicone Compounds Adapted to Foundry Use. Thomas A. Dickinson. *Foundry*, v. 77, Sept. 1949, p. 180-182.

A variety of new applications in the foundry. Use to permit die casting of steel, as bonding agents for molding and core sands, as mold-facing materials, as plasticizers for the flexible molds used with low-melting alloys, and as sealants for the pores of metallic castings. Characteristics of a series of Dow-Corning silicone fluids.

14A-123. Symposium on Running Methods. The Connor Runner. J. F. Measures. The Distributed Runner. P. A. Russell. Running and Feeding of Non-Ferrous Castings. D. W. Berridge. *Foundry Trade Journal*, v. 87, Aug. 11, 1949, p. 169-174; discussion, p. 174-176.

Various arrangements devised for conducting molten metal into the mold. Examples of castings made by use of these systems.

14A-124. Production Processes—Their Influence on Design. Part XLVI. Centrifugal Casting. Roger W. Bolz. *Machine Design*, v. 21, Sept. 1949, p. 107-112.

14A-125. Contribution au développement des applications de la centrifugation en fonderie. (Contribution to the Development of Centrifugal Casting.) Pierre Lefranc. *Fonderie*, June 1949, p. 1609-1616; discussion, p. 1616-1617.

Methods used in France for centrifugal casting of iron, special and malleable cast iron, ordinary and special steels, bronzes and brass, and aluminum. The theory of centrifugal casting is explained by a series of schematic drawings.

14A-126. Giess- und Anschnittfragen in Giessereien. (Pouring and Tapping Problems in Foundries.) E. Diepschlag. *Metall*, July 1949, p. 215-219.

Rate of flow from tilting and bottom-tap ladles is calculated. Relationship between flow conditions in the gates and rates of flow as well as the effects of potential and kinetic energies on the quality of the casting. Shows that the fluidity test is an important foundry method.

14A-127. Richtig formen! Das Verhalten von "Luft" in Formen und Kernen. (Proper Molding! The Effect of "Air" in Molds and Cores.) W.

Kohler. *Archiv für Metallkunde*, v. 2, no. 7, 1948, p. 230-237.

Principles of mold and core design to ensure that air does not become entrapped.

## 14B—Ferrous

14B-86. Variables in Producing Nodular Graphite Cast Iron by Magnesium Treatment. G. E. Holdeman and J. C. H. Stearns. *American Foundryman*, v. 16, Aug. 1949, p. 36-41.

The use of flux mixtures with the Mg alloys is said to have interesting possibilities.

14B-87. Oxygen Injection Process in Melting Low Carbon Cr-Ni Stainless Steel. H. J. Cooper. *American Foundryman*, v. 16, Aug. 1949, p. 44-46.

Effects of initial bath temperature, initial C and Cr contents, and volume of O<sub>2</sub> injected were studied. The use of oxygen in arc melting does not render the induction furnace obsolete for the melting of low-carbon 18-8. The oxygen-arc process reclaims low-quality 18-8 scrap of unknown carbon content while the induction melting process subsequently remelts the reclaimed heads and gates with close control of analysis.

14B-88. Gating Controls Temperature Gradients in Steel Casting. J. A. Stiffall. *American Foundryman*, v. 16, Aug. 1949, p. 52-53.

Improved gating technique for 45,000-lb. steel castings (cylinders for hydraulic presses).

14B-89. An Unusual Steel Casting. *British Steelmaker*, v. 15, Aug. 1949, p. 377-379.

Exacting technique employed to overcome production problems in the single-piece casting of a trolley frame for a 10-ton floor charger.

14B-90. Grinding Balls. E. F. Farren. *Foundry Trade Journal*, v. 87, Aug. 4, 1949, p. 155-157.

Mass production by centrifugal casting.

14B-91. Ship's Castings; Modern Methods and Equipment for the Production of Large Units. *Iron and Steel*, v. 22, Aug. 1949, p. 383-384.

14B-92. The Mechanism of Freezing of Horizontal Steel Castings. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 437-450.

A detailed metallurgical study of 15 experimental carbon steel castings made to ascertain the influence of casting temperature upon the mechanism of solidification and, therefore, upon the structure and physical properties of steel castings.

14B-93. Pots à recuire la fonte malléable. (Crucibles for Remelting of Cast Iron.) Gabriel Joly. *Fonderie*, May 1949, p. 1591-1592.

Use of stainless steel or white cast iron to increase crucible life. Chemical composition and comparative costs. Methods for improvement of the durability of crucibles in general.

14B-94. Ueber das Verhalten von Formsand beim Abgießen von Stahl. (The Behavior of Molding Sands in the Casting of Steel.) Hans Zeuner and Karl Roesch. *Die Neue Giesserei*, v. 36 (new ser., v. 2), July 1949, p. 195-199.

The sudden change in the size of the quartz grains when heated by the molten steel as well as the sudden formation of vapor and gases at the outer layer of the sand mold are important factors in the formation of scab. Phenomena at the surface of the sand when the steel is cast were studied by expansion and gas-pressure measurements.

14B-95. Effect of Stripping Temperature on the Properties of Pearlitic Grey Cast Iron. *Foundry Trade Journal*, v. 87, Aug. 18, 1949, p. 201-209; Aug. 25, 1949, p. 237-241; discussion, p. 241-245.

Committee report. Trend toward rapid removal of castings from the molds, while still at high temperatures. Considers only castings stripped as a whole and cooled to room temperature in still air. No attention was given to effects of accelerated cooling after stripping, nor to the stripping of only certain parts of a casting in order to reduce distortion or cracking. Mechanical properties of bars and other shapes of alloyed and unalloyed iron, and effects of stripping temperature on distortion.

14B-96. New Memphis Foundry Sets Standard in Good Working Conditions. William G. Gude. *Foundry*, v. 77, Sept. 1949, p. 66-71, 152, 155.

Procedures and equipment of new gray-iron foundry of International Harvester Co.

14B-97. Casting a Long Roll Grinder Bed. Pat Dwyer. *Foundry*, v. 77, Sept. 1949, p. 86-88, 220.

Several interesting features in advanced foundry practice. Weight is 58,020 lb. and length 42 ft., 9 in.

14B-98. Core Making and Mould Closing. *BSFA Bulletin*, v. 1, July 1949, p. 1-7.

In the steel foundry.

## 14C—Nonferrous

14C-65. Trends in Methods of Melting and Casting for High Conductivity Copper Wire Bars. R. H. Bauld. *Institution of Mining and Metallurgy*, Preprint No. 7 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 18 pages.

Major steps already taken to depart from the reverberatory type of refining and casting on wheels with horizontal molds open to the atmosphere. 19 ref.

14C-66. Motor Cycle Castings. *Metal Industry*, v. 75, July 15, 1949, p. 46-47.

Production of ferrous and nonferrous castings for motorcycle components by a British firm.

14C-67. Four Second Cycle Die Casting. Walter R. Ellis. *Applied Hydraulics*, v. 2, Aug. 1949, p. 6-7, 18-19.

A 4-sec. or shorter cycle for die casting 8-oz. shots was made possible by the use of a low-pressure-operated intensifier assembled integrally with the die-closing cylinder.

14C-68. Safety Devices for Die Casting Dies. H. K. Barton. *Machinery* (London), v. 75, July 28, 1949, p. 132-138.

14C-69. Coulee en coquille des bronzes d'aluminium. (Chill Casting of Aluminum Bronzes.) Maurice Billing and George Blanc. *Fonderie*, May 1949, p. 1593-1597.

Results of experimental investigation indicate that gravity casting in metal molds is most suitable. Recommended procedures.

14C-70. Die Zinkgusslegierung Zn-Al 2, Cu 1. (The Cast Zinc Alloy Containing 2% Al and 1% Copper.) Karl Löbberg. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 220-224.

Conditions for pressure casting of the above alloy as well as its mechanical and corrosion-resistant properties.

14C-71. Trvale magnety lite do pisku. (Sand Cast Permanent Magnets.) J. Zampach and O. Starosta. *Hutnické Listy*, v. 4, Jan. 1949, p. 14-17; Feb. 1949, p. 51-52.

Production of permanent magnets of the Al-Ni-Cu-Co-Ti and Al-Ni-Cu-Co types. Heat treatment and magnetic properties.

14C-72. Safety Devices for Die Casting Dies. H. K. Barton. *Machinery* (London), v. 75, Aug. 25, 1949, p. 278-284.

Devices designed to prevent injection of molten metal unless all the separate die elements are in a pre-

scribed positional relationship. Second of two articles.

**14C-73. Producing Nonferrous Sand Castings to Close Tolerances.** Herbert Chase. *Foundry*, v. 77, Sept. 1949, p. 90-95, 184, 186, 189-190.

Procedures and equipment at Sperry Gyroscope Co.

**14C-74. How To Control Fumes in Nonferrous Melting.** Robert H. Haley. *Foundry*, v. 77, Sept. 1949, p. 118, 121.

Recommended procedures designed to meet California's new law regarding atmospheric pollution, without use of collection systems.

**14C-75. Änderung der Eigenschaften von Zink-Druckgusslegierungen bei Raumtemperatur.** (Changes in the Properties of Zinc Pressure-Cast Alloys at Room Temperature.) Erich Meyer-Rässler. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 270-274.

The effect of aging (up to two years) on the hardness, strength, and elongation of five different zinc alloys was investigated. The greatest changes occurred during the first few months and pouring temperatures (420-560° C.) and mold temperatures (130-175° C.) had little effect on strength. Secondary zinc was found to be as good as primary zinc.

**14C-76. Nickel für Radioröhren.** (Nickel for Radio Tubes.) H. Weber. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 198.

Melting, methods of processing the ingots, and causes of production difficulties. Hardness and analytical data.

#### 14D—Light Metals

**14D-42. Die Cast Aluminum K-F Door.** *Modern Metals*, v. 5, Aug. 1949, p. 30.

The largest-area aluminum die casting ever made, an automobile door produced by Doehler-Jarvis Corp. for Kaiser-Frazer Corp. on an experimental basis.

**14D-43. Aluminum Die Casting Production Facilitated by New Plant Layout.** Roy F. Johnson. *Steel*, v. 126, Aug. 22, 1949, p. 60-63.

How parts for washing and ironing machines are cast, trimmed, machined and handled efficiently.

**14D-44. Aircraft Engine Castings.** The Foundries of The Bristol Aeroplane Company Ltd. *Metal Industry*, v. 75, July 29, 1949, p. 83-85; Aug. 5, 1949, p. 107-108.

**14D-45. Rechnerische Behandlung des Erstarrungsvorgangs beim Duralumin-Tütemguss.** (Mathematical Treatment of the Solidification of Quench-Cast Duralumin.) J. Bingel. *Archiv für Metallkunde*, v. 3, May 1949, p. 174-180.

Rates of immersion for different ingot diameters. A diagram shows the furnace and quenching arrangement.

**14D-46. Pimpling of Aluminum Die Castings.** R. A. Quadt and D. L. Lavelle. *Steel*, v. 125, Sept. 5, 1949, p. 87-88, 120, 122.

Previously abstracted from *Die Castings*. See item 14D-40, 1949.

**14D-47. Motor Rotors Can Be Die-Cast.** *American Machinist*, v. 93, Sept. 8, 1949, p. 116-117.

How clusters of four rotors for fractional-horsepower motors are die cast in aluminum with less labor, less time, and fewer rejects than for copper-bar rotors. Steel laminations and shafts are used as inserts.

**14D-48. Influence des conditions de solidification sur la texture et la répartition des constituants dans les ébauches de fonderie.** (Influence of Conditions of Solidification on Crystal Structure and Distribution of Constituents in Rough Castings.) Jean Héren-guel. *Fonderie*, June 1949, p. 1618-1622.

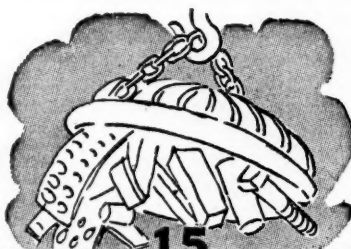
Recommended procedures for light alloys.

**14D-49. Die-Casting Without Ejector Pins and Retractable Cores.** Arthur Mumper. *Machinery* (American), v. 56, Sept. 1949, p. 195-197.

Die used to cast Al alloy gear covers at the rate of 250 per hr.

For additional annotations indexed in other sections, see:

2B-250; 6B-135; 16A-75; 17-79; 23D-92; 24A-122; 24B-40; 24D-15



#### SCRAP and BYPRODUCT UTILIZATION

**15-58. The Precious Metals.** H. Gordon Dale. *Institution of Mining and Metallurgy*, Preprint No. 5 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 12 pages.

Recovery from various materials which are usually residues and waste products in the precious-metal industries. 37 ref.

**15-59. The De-Tinning of Old Cans.** *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 89-91.

Plant and process. Produces scrap suitable for direct use in steelmaking furnaces, tin, and solder.

**15-60. Bergung und Aufarbeitung von Trummermetallen.** (Storage and Processing of Scrap Metal.) W. Wiederholt. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, June 1, 1949, p. 267-269.

Specific methods, including methods of removing rust and greases from steel and iron parts and methods of protection against corrosion.

**15-61. Die Verarbeitung von Neusilber-schrott nach verschiedenen Verfahren.** (Different Methods for Processing Nickel-Silver Scrap.) Hans Tzschaschel. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, June 1949, p. 161-168; July 1949, p. 212-214.

The importance of dissociating nickel silver into its constituent elements. Critically evaluates the converter and the electrolytic processes of extracting Cu, Ni, and Zn from the scrap. July: the carbonyl process, the vaporization process, and distillation melting.

**15-62. Refining Light Metal Scrap; Pre-Treatment—Processes—Furnaces.** Adolf Beck. *Metal Industry*, v. 75, Aug. 12, 1949, p. 129-132.

Process for refining Al scrap preparatory to the production of standard alloy compositions. Process may be developed to a stage permitting production of alloys exceeding in purity those which it is possible, at present, to produce from ordinary primary Al of commercial purity.

**15-63. Aufarbeitung des Leichtmetall-schrotts.** (Processing Light-Metal Scrap.) A. Beck. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 181-185.

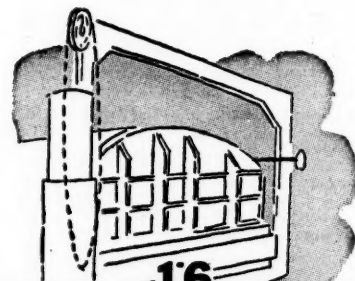
Several modern methods of melting light metal scrap with special emphasis on Al alloy scrap. Proposed method permits the economical production of high-purity Al, superior to that produced by usual methods.

**15-64. How Timken Expedites Steel Mill Scrap Preparation.** Frank C. Wier. *Iron Age*, v. 164, Sept. 15, 1949, p. 88-90.

Use of the Linde powder-cutting process.

For additional annotations indexed in other sections, see:

2B-234; 2C-75



#### FURNACES and HEATING DEVICES

##### 16A—General

**16A-74. Design and Performance of Modern Large Rotary Furnaces.** A. F. Kritscher. *Industrial Gas*, v. 28, Aug. 1949, p. 7, 24-26.

Previously abstracted from *Industrial Heating*, item 16A-62, 1949.

**16A-75. Wax Eliminating and Flask Temperature Control Furnace.** Charles T. Dierker. *Industrial Gas*, v. 28, Aug. 1949, p. 8, 27.

Furnace used in the production of precision castings by the lost-wax investment process.

**16A-76. The Fields of Use for Prepared Atmospheres.** W. A. Darrah. *Industrial Gas*, v. 28, Aug. 1949, p. 9-12, 20-24.

Metallurgical and other uses.

**16A-77. Protective Atmospheres in Industry.** Part IX. A. G. Hotchkiss and H. M. Webber. *General Electric Review*, v. 52, Aug. 1949, p. 26-29.

Some of the typical instruments used in the controlling and measuring of various industrial gases, and the general principles upon which their operation is based. (To be continued.)

**16A-78. Heat Radiation Development.** Jay D. Willis. *Steel*, v. 125, Aug. 29, 1949, p. 86.

180° oval-shaped radiant tube. Installation steps up furnace efficiency and cuts fuel costs.

**16A-79. Large, Modern Industrial Gas-Fired Processes Tailored to Fit the Job.** James Kniveton. *Industrial Heating*, v. 16, Aug. 1949, p. 1342-1344, 1346, 1348, 1350, 1352, 1480.

A number of facts developed through research and production installations are said to make textbook formulas obsolete. Installations for heating automotive connecting-rod blanks, end heating of bars, reheating of seamless tube, and brazing aluminum drier assemblies for refrigerators.

**16A-80. Fundamental Data for Induction and Dielectric Heating.** (Concluded.) Part III. Dielectric-Heating Formulas. *Industrial Heating*, v. 16, Aug. 1949, p. 1374, 1376.

**16A-81. Production of Metallurgical Coke.** M. D. Edington. *Foundry Trade Journal*, v. 87, Aug. 4, 1949, p. 149-153.

The relationship of modern trends to cupola practice based on British conditions with respect to coal reserves and properties of British coals.

**16A-82. Der Soll-Verbrauch von Kleinschmiedeoefen.** (The Calculated Fuel Consumption of Small Forging Furnaces.) Paul-Otto Veh. *Stahl und Eisen*, v. 69, July 21, 1949, p. 514-519.

65 forging furnaces of different designs and sizes were studied to determine the relationship between heat consumption and interior-surface area. A method of compiling theoretical consumption curves of gas-heated forging furnaces.

**16A-83. How Much Does It Cost to Use Radio-Frequency Heating?** A. P. Bock. *Machine and Tool Blue Book*, v. 45, Sept. 1949, p. 71-74, 76, 78-80, 82, 84. See abstract from *Industrial Heating and Steel*, item 16A-20, 1949.

**16A-84. Gas Fired Annealing Furnace Handles Railroad Tank Cars.** *Iron Age*, v. 164, Sept. 8, 1949, p. 85-86.

A furnace 52 ft. long, 19 ft. wide and 21 ft. high, for annealing or stress-relieving welded railroad-car tanks and other vessels. Burner capacity is sufficient to bring the furnace, plus a 75-ton charge, to 1600° F. in 3 hr. Wall and arch design, burner arrangement, and controls.

**16A-85. The Use of Oxygen in the Ferrous and Non-Ferrous Metallurgical Industries.** J. O. Brandt. *Journal of the Society of Glass Technology*, (Transactions Section), v. 33, Apr. 1949, p. 103-119.

The openhearth steel-melting furnace is compared with the glass-tank furnace. Use of oxygen as a means of enhancing flame temperature in the openhearth, both from a theoretical and practical standpoint; details of the various procedures. The maximum permissible roof temperature is probably the most important factor limiting the widespread use of oxygen in nonferrous process furnaces and glass tanks.

**16A-86. La transmission de la chaleur dans les fours métallurgiques.** (Heat Transfer in Metallurgical Furnaces.) C. Hulse and R. J. Sarjant. *Revue de Métallurgie*, v. 46, May 1949, p. 297-308.

Existing methods for calculation of the above, and several new graphical methods. Analysis of heat transfer using these methods indicates the importance of uniform heating, which may reduce considerably the time necessary for a given process.

**16A-87. Classification of Properties of Combustible Substances Characterizing Their Behavior in the Blast-Furnace Process.** (In Russian.) K. I. Syskov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Apr. 1949, p. 514-518.

Properties are tabulated according to their proposed classification, indicating individual influence on the blast-furnace process.

**16A-88. High Speed Gas Heating.** Part I. S. L. Case. *Steel Processing*, v. 35, Aug. 1949, p. 425-428.

Design of ceramic burners—superheat slot-type, radiant-cup, and those used to impinge heat directly on the part. Technology of this type of gas heating. Heating of tubular shapes for hot forming operations. (To be continued.)

## 16B—Ferrous

**16B-82. Furnaces for Gas Carburizing; Design and Operation.** S. L. Widrig and Wilson T. Groves. *Metal Progress*, v. 56, Aug. 1949, p. 194-199.

An interesting variant from conventional practice consists of carburizing at 1725, intermediate cooling to 1150 and reheating to 1550° F. (all in one trip through a continuous furnace), oil quenching, washing, and then drawing at 340° F. This increases production rate of heavy

parts for automotive transmissions, and produces, in SAE 8620 or 4320 gear teeth, a superior microstructure consisting of fine-grained, relatively low-carbon martensite, with some excess carbide in the surface zone. Such carbides greatly increase wear resistance and do not harm impact properties if well distributed.

**16B-83. Open-Hearth Furnace Models.** Part I. Flow Patterns in Ducts. J. H. Chesters and A. R. Philip. Part II. Flow Visualization and Photography. R. S. Howes and A. R. Philip. Part III. Flow Patterns in Model Furnaces. I. M. D. Halliday and A. R. Philip. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 385-415.

Part I: Flow patterns obtained in various two-dimensional shapes when water is introduced through jets and allowed to escape over weirs. Entrainment, recirculation, and the stability or instability of certain cross sections are reached. Flow patterns were studied by means of photography of water containing graded bakelite powder moving in transparent dishes of various shapes and with differently arranged jets. Part II: installation and operation of 1/24 scale-model openhearth furnaces in which water is circulated to represent gas and air. Photographic and other techniques used. Part III: the extent to which flow through a water model is comparable with flow of gases through a full-scale furnace. Flow pattern observed in openhearth furnace models of Maerz, single air-uptake, and semi-Venturi design and effects of certain modifications. 62 ref.

**16B-84. Experiments on Gaseous Mixing in Open-Hearth Furnace Models.** Part I. Maerz. R. D. Collins and J. D.

Tyler. *Journal of the Iron and Steel Institute*, v. 162, Aug. 1949, p. 457-466.

A technique using models was applied to some designs of producer-gas-fired openhearth furnaces. CO<sub>2</sub> was used as a tracer and concentrations were measured by means of an infrared gas analyzer. Designs tested are essentially of the Maerz type, but one semi-Venturi type is included for comparison. Use of a central air port shows considerable improvement as regards mixing.

**16B-85. Der Einfluss des Gichtdurchmessers auf das Verhalten des Feingutes im Hochofen.** (Effect of Throat Diameter on the Behavior of Small-Particle Charges in the Blast Furnaces.) Paul Reichard. *Stahl und Eisen*, v. 69, July 21, 1949, p. 503-508.

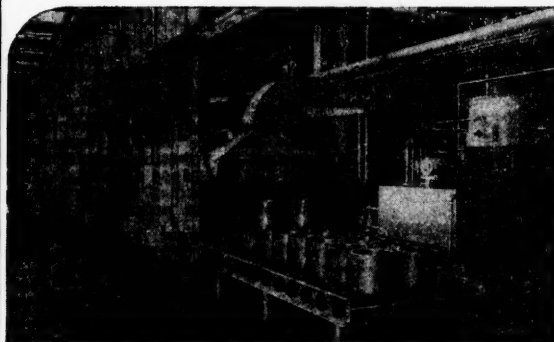
Effects of a widened throat on gas velocity, dust formation, and dust accumulation. Volume, composition, and velocity of gas flow in the various sections of the furnace and pressure on the charge are calculated. Conditions that cause accumulation of dust in the blast furnace.

**16B-86. Strömung und Gichtstaubentfall im Hochofen.** (Flow and Dust Emission from the Throats of Blast Furnaces.) Michael Hansen. *Stahl und Eisen*, v. 69, July 21, 1949, p. 526-528.

Discussion of paper by Paul Reichard on "Effect of Throat Diameter on the Behavior of Small-Particle Charges in the Blast Furnace." See item 16B-85.

**16B-87. Spotreba koksu ve vysoke peci.** (Coke Consumption in the Blast Furnace.) Bohumil Spichal, Jr. *Hutnické Listy*, v. 4, May 1949, p. 139-141.

Effect of blast temperature, at constant ash content of the coke, in production of hot and cold irons.



## SCALE FREE FINISH ANNEALING 5000 lbs. of brass strip per hour

● The gas-fired roller hearth furnace pictured above is of EF's semi-continuous intermittent operating design, with separate chambers for preheat, anneal and cool. Special ratio controls produce the exact atmosphere desired, and an ingeniously designed forced circulation system assures a uniform anneal and surface finish day after day. Let us show you how EF research, EF design, and EF experience has greatly advanced the metallurgical processing of ferrous and non-ferrous metals, resulting in closer physical tolerances, uniform finish, and efficient, low cost, trouble-free operation.

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OF FURNACE  
FOR EVERY  
PROCESS  
PRODUCT OR  
PRODUCTION

16B-88. Ohio Firm Reveals Details of Its New Shaft-Type Electric Blast Furnace. *Iron Age*, v. 164, Sept. 1, 1949, p. 101.

Schematic diagram and brief description of silvery-iron plant of Cascade Iron Corp.

## 16C—Nonferrous

16C-9. Induction Melting of Titanium Metal in Graphite. J. E. Sutton. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 73-74; discussion p. 75-76. See abstract from *Metal Progress*, item 2D-10, 1949.

16C-10. The Production and Arc Melting of Titanium. O. W. Simmons, C. T. Greenidge and L. W. Eastwood. *Office of Naval Research*, "Titanium"; Report of Symposium on Titanium", Mar. 1949, p. 77-90; discussion p. 90-91. See abstract from *Metal Progress*, item 2D-12, 1949.

16C-11. Immersion Heaters Boost Production of Storage Batteries. *Industrial Heating*, v. 16, Aug. 1949, p. 1384.

16C-12. Practical Aspects of Fuel Utilization in a Large Works. F. C. Ashen. *Journal of the Institute of Fuel*, v. 22, Aug. 1949, p. 313-320.

Fuel consumption data of plants forming a cross-section of the non-ferrous metal industry are analyzed to show the basic coal equivalents used for various main processes. Fuel aspects of some metallurgical processes. Effect on fuel economy of converting different types of metallurgical furnaces to the concentrated-combustion method of gas firing.

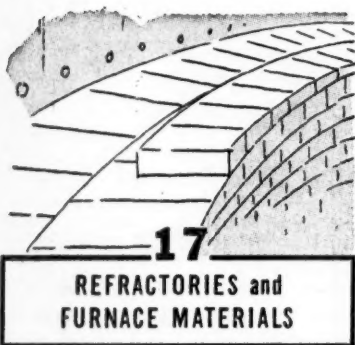
## 16D—Light Metals

16D-3. Die Casting Plant Cuts Costs by Induction Melting. F. J. Kamin. *Modern Metals*, v. 5, Aug. 1949, p. 27-29. Condensed from *Materials and Methods*.

Previously abstracted from original. See item 16d-4, 1948.

For additional annotations indexed in other sections, see:

14A-115



## REFRACTORIES and FURNACE MATERIALS

17-79. Good Refractories + Proper Use = Improved Performance. Frank A. Czapski. *American Foundryman*, v. 16, Aug. 1949, p. 54-55.

Recommended refractories for specific locations in the foundry and proper procedures of use.

17-80. Carbon Linings for Blast Furnaces. J. H. Chesters and G. D. Elliot. *Iron Age*, v. 164, Aug. 18, 1949, p. 89-97. Experiences in Great Britain. Various successful construction techniques. Relative characteristics of carbon bricks and conventional blast-furnaces refractories. 19 ref.

17-81. Chemical Changes in Basic Brick During Service. T. F. Berry, W. C. Allen, and R. B. Snow. *Blast Furnace and Steel Plant*, v. 37, Aug. 1949, p. 996. A condensation.

Previously abstracted from *Industrial Heating*. See item 17-74, 1949.

17-82. Basic Brick in the Open Hearth Furnace. Vernon W. Jones. *Industrial Heating*, v. 16, Aug. 1949, p. 1441-1442, 1444, 1446, 1448, 1450.

Advantages and operational experience and data on the use of magnesite and chrome-magnesia brick in the hearth; steel-clad magnesite in the frontwalls, endwalls, backwalls, and bulkheads; and subsequent use of suspended construction for basic roofs and all-basic furnaces.

17-83. Steel-Tight Linings for Basic Induction Furnaces. J. H. Chesters, L. Lee, and J. Mackenzie. *Transactions of the British Ceramic Society*, v. 48, Aug. 1949, p. 263-287; discussion, p. 287-290.

Principles involved in maintaining steel tightness in refractory linings with particular reference to induction furnace steelmaking. Several basic lining compositions. Development work to produce a monolithic lining from sea-water magnesia that would show permanent expansion in intermediate temperature ranges. The most satisfactory results were obtained with additions of 4% sand and 2% borax to magnesia. Some available commercial linings, their installation and maintenance. Control charts for grading, low-temperature expansion at 1150° C. and high-temperature shrinkage. 23 ref.

17-84. Beitrag zum Verhalten von Graphit und Kohlenstoff in Schamottewerkstoffen. (The Behavior of Graphite and Carbon in Refractory Materials.) Fritz Harders and Hubert Grewe. *Stahl und Eisen*, v. 69, July 21, 1949, p. 519-523.

Carbon, primarily in the form of graphite, can be embedded in refractory materials by treatment at 1000-1200° C. in a stream of coke-oven gas. A carbon content of 1.5-2.0% considerably improves the heat resistance of the refractory material under pressure and decreases its tendency to adhesion, but does not affect its resistance to slagging. An improved method of testing for heat resistance under pressure.

17-85. O zhotoveni kysele vyzdivky vysokofrekvenčni pece na taveni oceli a o její trvanlivosti. (The Preparation of an Acid Lining of a High-Frequency, Steel-Melting Furnace and Its Performance.) Jan Kulhánek. *Hutnické Listy*, v. 4, Apr. 1949, p. 101-104.

For a 2½-ton furnace. Types of steels that may be prepared, life of lining, current consumption.

17-86. Refractory Practice in the Whiting-Cole Recirculating Annealing Oven. Ray A. Witschey. *Foundry*, v. 77, Sept. 1949, p. 80-83, 244-245.

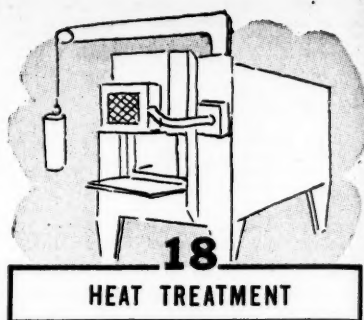
Choice of suitable refractories for different parts of the furnace, and methods for their installation.

17-87. Hydraulic Activity of Granular Slags. (In Russian.) N. A. Toropov and B. V. Volkonskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 95-97.

Influence of the vitreous component of granular blast-furnace slags on the properties of slag cements. Activity of the slags is determined by chemical composition and by the composition ratio of vitreous and crystalline components, which may vary over a wide range.

For additional annotations indexed in other sections, see:

2B-244; 16A-88



## HEAT TREATMENT

### 18A—General

18A-27. The Manufacture of Springs With Low Thermal Coefficients of the Modulus of Elasticity. Stephan Thyssen-Bornemisza. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 129-133. Translated from the German. Object of spring treatment. Methods used for influencing the thermal coefficient of the modulus of elasticity. (To be continued.)

18A-28. Das Abkühlungsvermögen flüssiger Härtemittel. (The Cooling Effect of Liquid Hardening Agents.) Walter Peter. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 263-274. The quenching properties of water, oils, aqueous salt solutions, and metal and salt baths were investigated by the silver-sphere method. Differences in the quenching properties of water were found to be caused by their variable contents of different gases and inorganic compounds. Quenching properties of the other media can be varied greatly by change of temperature, composition, etc. 20 ref.

18A-29. Die Wärm-Elektrode, ein neues Hilfsmittel zur örtlichen Wärmebehandlung und Erwärmung. (The Heating Electrode, a New Means of Local Heat Treating and Heating.) H. Schottky and F. H. Müller. *Schweissen und Schneiden*, v. 1, May 1949, p. 78-81. A patented electrode which, upon heating, is converted into slag and thus merely heats the metal to which applied. Principles and procedures.

18A-30. Verbesserung der Haftfähigkeit von Nickel- und Hartchromschichten und der Wechselfestigkeit vernickelter und verchromter Teile durch Wärmebehandlung. (Increasing the Adhesivity of Nickel and Hard-Chromium Plating and the Fatigue Strength of Nickel and Chromium-Plated Parts by Heat Treatment.) K. Wellinger and E. Keil. *Metalloberfläche*, v. 2, Nov. 1948, p. 233-236. Good results for such treatment. Photographs show the type of bars used for testing.

### 18B—Ferrous

18B-147. The Influence of Heating Rate in Malleable Iron Annealing. S. W. Palmer. *Foundry Trade Journal*, v. 87, July 28, 1949, p. 107-118; Aug. 4, 1949, p. 139-148.

Previously abstracted from *Engineering*. See item 18B-139, 1949.

18B-148. A Critical Review of the Nitriding Process. Lester F. Spencer. *Steel Processing*, v. 35, June 1949, p. 311-318; July 1949, p. 375-380, 382, 390.

Advantages and disadvantages. Nitriding compositions and effects of each element contained in the standard nitriding analysis (C, Al, Cr, Ni, Mo, S, Se, and Si). Details of the process (alternate methods) and equipment. Physical properties of some nitriding steels and effects of variations in compositions and treatment conditions. 47 ref.

**18B-149. Some Observations on the Accuracy of Isothermal Diagrams.** B. F. Shepherd. *Iron Age*, v. 164, Aug. 25, 1949, p. 61-66.

Extensive cooling-rate experiments indicate that steel specimens undergoing transformation during quenching do so at higher temperatures than those used in isothermal transformation diagrams. Supporting data in the form of cooling curves and cooling-rate curves for various conditions.

**18B-150. Induction Heating Solves Hardening Problems.** Fred McNall and Richard A. Gehr. *American Machinist*, v. 93, Aug. 25, 1949, p. 100-102.

How valve seats, piston rods, set-screws, and crosshead pins are successfully hardened with higher production rates, better quality and lower cost.

**18B-151. Strain-Age-Hardening.** C. A. Edwards. *Iron and Steel*, v. 22, July 1949, p. 365-368; Aug. 1949, p. 401-404.

Present knowledge of hardening by quenching, quench-age hardening, and strain-age hardening. 26 ref. (To be concluded.)

**18B-152. Induction Hardening of Lawn Mower Blades and Cutters.** *Machinery* (London), v. 75, Aug. 4, 1949, p. 154-155. Equipment and procedures.

**18B-153. Einfluss der Wärmebehandlung auf die magnetischen Eigenschaften eines Chrom-Magnetstahls.** (Effect of Heat Treating on the Magnetic Properties of a Chromium Magnet Steel.) Werner Jellinghaus. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 249-254.

Experimental results.

**18B-154. Einfluss der Anlasszeit auf die Härte von Werkzeugstahl.** (Effect of Annealing Time on the Hardness of Tool Steel.) Anton Pomp and Alfred Kirsch. *Archiv für das Eisenhüttenwesen*, v. 20, July-Aug. 1949, p. 255-262.

The effect of intermittent annealing of 24 toolsteels for about 1000 hr. in the range 50-270° C. was studied. Experimental procedure and results. 27 ref.

**18B-155. Isotermické kalení.** (Isothermal Quenching.) Cenek Duchon. *Hutnické Listy*, v. 4, Apr. 1949, p. 105-112; May 1949, p. 142-143.

Use of alloying elements which increase hardenability, such as Mn, Cr, Ni, and Mo, and proper choice of austenitizing temperatures, to extend isothermal quenching to depths of 25 mm. or more. Summarizes present knowledge of isothermal changes in various types of alloy steel in the upper portion of the S-curve.

**18B-156. Concerning the Study of Isothermal Transformations in High Speed Steel. III.** (In Japanese.) S. Koshiba. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 40-43.

Effect of heat treatment variables on five different types of high speed steel was studied. Mechanism of the transformation at 300° C. Effects of time of treatment on cutting-tool serviceability were determined.

**18B-157. Heat Treatment of Tool Steels by Martempering.** Richard Paul Seelig. *Iron Age*, v. 164, Sept. 1, 1949, p. 72-76.

Application of martempering to heat treating tool and die steels in comparison with other heat treatment procedures. Influence of heat treatment variables on hardness, distortion, and dimensional stability.

**18B-158. Increasing Output of Induction Hardened Parts With Automatic Work Fixtures.** John Evans. *Automotive Industries*, v. 101, Sept. 1, 1949, p. 38-39, 67.

Several examples.

**18B-159. Stress-Relief Heat Treatment of Alloy Cast Iron.** M. M. Hallett and P. D. Wing. *Foundry Trade Journal*, v. 87, Aug. 11, 1949, p. 177-183.

Results of an experimental investigation of the above, using ring-shaped test pieces, subjected to preliminary treatment at 550° C. for 1 hr. Materials used were sand-cast gray iron and centrifugally cast liner iron, austenitic iron, and 33% Cr iron.

**18B-160. Continuous Gas Carburizing.** R. J. Cowan. *Steel*, v. 125, Sept. 5, 1949, p. 78-81, 127; Sept. 12, 1949, p. 114-116, 118, 120.

Formation of CG gas, carbon deposition within the muffle, dry cyaniding, use of oil instead of gas as a source of hydrocarbon and control of carburizing atmosphere.

**18B-161. Practical Pointers on Steel Treating. Part IX.** (Concluded.) W. R. Bennett. *Modern Machine Shop*, v.

22, Sept. 1949, p. 138, 140, 142, 144, 146, 148, 150, 152, 154, 156.

Pack hardening high speed steel; long draw, high-carbon, high-chromium; and hardening splined shafts.

**18B-162. Recuit des fontes malléables à coeur noir.** (Annealing of Blackheart Malleable Cast Iron.) Gabriel Joly. *Fonderie*, June 1949, p. 1624-1625.

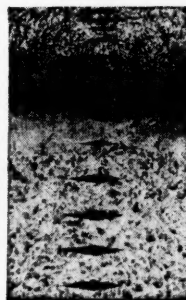
Optimum annealing condition for iron containing 2.30-2.45% C, 1.20-1.40% Si is: heating to 920° C. as rapidly as possible, holding at this temperature for 30 hr., cooling very rapidly to 780° C., and cooling to 690° C. over 60-80 hr.

**18B-163. Properties of Heat Treated Alloy Castings.** J. B. Caine and R. S. Haight. *Metal Progress*, v. 561, Sept. 1949, p. 360-B.

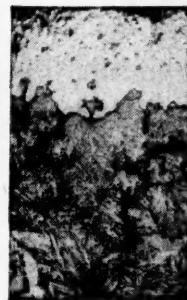
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Microstructure of specimens carbo-nitrided for four hours at 1500°F., quenched in oil.

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- Carbon and nitrogen concentrations can be controlled.
- Washing and cleaning operations are reduced and simplified . . . working conditions are cleaner and safer.
- Because lower quenching rates can be used . . . distortion and cracking is reduced; plain carbon steels may be substituted for alloy steels.

- More uniform cases are produced. An even case can be produced on free-machining screw stock.
- Because lower operating temperatures can be used, furnace maintenance is simplified, fuel costs are lowered.
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Properties after tempering at 1200° F., shown by graphs of hardness vs. cooling rate, and micrographs, for six alloy steel compositions. Other mechanical properties are also indicated. (Data sheet.)

**18B-164. Slack Quenching Versus Quench Cracking.** J. B. Caine and R. S. Haught. *Metal Progress*, v. 56, Sept. 1949, p. 361-366.

Experience seems to indicate that brittle failures in service occur only in steels whose Charpy impact at service temperature is less than 10 ft.-lb. and is independent of microstructural constituents and their distribution. "Slack quenching", therefore, should be permissible for the vast majority of steel castings, plain or alloyed, since it gives far better Charpy values than annealing.

**18B-165. Precision Heat Treating Small Steel Parts at IBM.** Herbert Chase. *Iron Age*, v. 164, Sept. 15, 1949, p. 83-87. Practices and equipment.

## 18C—Nonferrous

**18C-10. Hydrogen in Cathode Nickel.** M. G. Corson. *Metal Progress*, v. 56, Sept. 1949, p. 360, 366.

Experimental data on effects of annealing at various temperatures on mechanical properties. Hydrogen was found to be responsible for increased ductility.

## 18D—Light Metals

**18D-11. The Effect of Quenching on the Age Hardening of Two Aluminum Alloys.** R. D. Barer and M. B. Bever. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 544-552.

Two Al alloys were aged at various temperatures after quenching from the solution treatment directly to the aging temperatures and also after first quenching into water. Progress of the aging reaction was followed by electrical resistance and hardness measurements. 22 ref.

**18D-12. Etude de la trempe d'un alliage léger du point de vue élastique.** (Study of the Quenching of a Light Alloy From the Point of View of Elasticity.) Charles Appert and Robert Cabarat. *Comptes Rendus (France)*, v. 228, June 13, 1949, p. 1871-1873.

Investigated for high-strength Al alloys (7-8.5% Zn, 1.75-3% Mg, 1.0-2.0% Cu, 0.1-0.6% Mn, 0.2-0.4% Cr). Internal friction increases rapidly to a maximum during the early part of the aging process, apparently because of heterogenization of the solid solution prior to precipitation of a new phase. After this point, internal friction decreases gradually. The variation of Young's modulus follows that of hardness. Modulus of elasticity is apparently influenced only slightly by changes in structure.

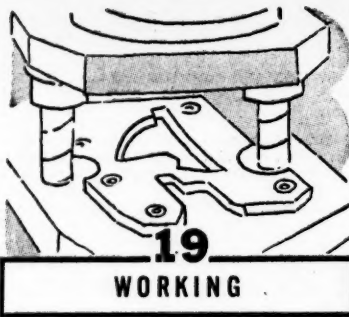
**18D-13. Über die Stabilität einer Al-Mg-Zn-Legierung mit 4,5% Zn u. 3,5% Mg (Hy 43).** [The Stability of an Al-Mg-Zn Alloy With 4.5% Zn and 3.5% Mg (Hy 43).] H. Vosskuhler. *Archiv für Metallkunde*, v. 3, July 1949, p. 262-264.

Stability was determined by measuring the electrical resistance of the alloy age-hardened at different times and temperatures and comparing results with those for an Al-Cu-Mg alloy. Stability is found to decrease with increasing age-hardening temperature, and tensile strength is not materially affected at temperatures below 60-70° C.

For additional annotations indexed in other sections, see:

3B-175-182; 4B-87; 4C-107-109; 7C-32; 16A-84; 16B-82; 19B-175

METALS REVIEW (44)



## 19A—General

**19A-190. Why Shear Is Applied to Dies.** J. R. Paquin. *American Machinist*, v. 93, Aug. 25, 1949, p. 84-85.

Several factors make shear desirable in cutting dies, the principal one being reduction in power required to operate the press. Recommended methods.

**19A-191. Fundamentals of the Working of Metals. Part II. Effects of Forming Speed.** George Sachs. *Modern Industrial Press*, v. 11, Aug. 1949, p. 6, 8, 46, 48, 50.

Clarified by means of diagrams.

**19A-192. The Fundamentals of Metal Forming. Part I. Modern Industrial Press**, v. 11, July 1949, p. 32, 34.

Low-temperature brittleness; cold working; hot working; overheating; forming resistance and temperature. (To be continued.)

**19A-193. Fabrication of Sheet Metal at Solar Aircraft Company.** Gerald E. Stedman. *Modern Industrial Press*, v. 11, Aug. 1949, p. 38, 40, 42, 44.

Press operations and equipment. Much of the metal forming is accomplished on dies produced by the "Sol-A-Die" process. High-temperature alloys are the principal materials.

**19A-194. The Evolution of Roasting Pans.** Joseph Nash. *Sheet Metal Worker*, v. 40, Aug. 1949, p. 45-47.

How modern equipment produces a superior product at a rate of 1000 per day. Principal techniques are forming, welding, and riveting.

**19A-195. Determining the Centre of Cut for Blanking and Piercing Tools.** Federico Strasser. *Machinery* (London), v. 75, Aug. 4, 1949, p. 158. Simple technique.

**19A-196. Forming Operations on Multi-Slide Machines.** *Machinery* (London), v. 75, Aug. 4, 1949, p. 162-163.

**19A-197. Cold Rolling Technique. IV. Simplified Rolling Mill Calculations.** Hugh Ford. *Sheet Metal Industries*, v. 26, July 1949, p. 1427-1436; Aug. 1949, p. 1651-1656, 1666.

How to use the Cook and Larke method, and application to typical cases. Calculation of roll force by the "energy method". Examples showing how to use the energy-roll-force curve. Calculated and experimental results compared. Energy method applied to results of rolling tests on copper. Results compared for 0.1-in. steel and copper of the same thickness. A generalized curve. (To be continued.)

**19A-198. Some Theoretical Aspects of the Determination of Plastic Strains in Sheet Metal.** K. L. Jackson. *Sheet Metal Industries*, v. 26, July 1949, p. 1447-1451; Aug. 1949, p. 1715-1720.

Calculation of drawing strains in tinplate 0.010 in. thick and with C16 tin coating. Limited to the case where the corner radius of the shells between the base and the wall is not more than 0.040 in. Analytical inves-

tigation of the three principal strains in the wall of a circular solid drawn shell (nonhardening material).

**19A-199. Wire Drawing: A New Application for 'VSG' Hydraulic Drives.** *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1685-1686.

**19A-200. Practical Problems of Light Presswork Production.** (Concluded.) J. A. Grainger. *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1703-1713, 1720.

Press-frame construction; improvements in operating controls; roll-feed mechanisms; clutches; automatic feeding mechanisms; guards; safety in design.

**19A-201. Pre-Spun Shapes Facilitate Drop Hammer Forming.** Gilbert C. Close. *Finish*, v. 6, Sept. 1949, p. 19-21, 54.

Research and plant experience in short-cutting fabrication procedure by spinning flat metal sheets into neutral shapes.

**19A-202. Cam-Operated, Double-Action Roofing Press Raises Output, Lowers Maintenance.** Gerald Eldridge Stedman. *Machine and Tool Blue Book*, v. 45, Sept. 1949, p. 96-100.

Use for manufacture of aluminum and steel roofing.

**19A-203. Die Innovations Can Speed Operations.** Frank Charity. *Machine and Tool Blue Book*, v. 45, Sept. 1949, p. 105-106, 108, 110, 112, 114.

Several interesting developments in die design and manufacture of products by presswork perfected in West Coast establishments.

**19A-204. Unusual Use of Forming Machine Solves Heater Production Problem.** *Machine and Tool Blue Book*, v. 45, Sept. 1949, p. 197-198.

Solution of a difficult forming problem in production of a heavily perforated, curved sheet.

**19A-205. Pre-Loaded Ball Bearing Guide Pin Bushings in Die Set Design.** *Tool & Die Journal*, v. 15, Sept. 1949, p. 56, 58, 60.

Advantages.

**19A-206. Copper-Base Die Alloys.** J. F. Klement. *Steel*, v. 125, Sept. 5, 1949, p. 84-86, 124.

New alloy claimed to afford longer life and freedom from galling, scratching, and die-maintenance downtime. Methods of production (static and centrifugal casting and torch overlay deposition on a steel or cast-iron die body), die finishing, drilling and tapping, and lubrication.

**19A-207. An Analysis of Blanking Die Designs. Part VI.** *Modern Machine Shop*, v. 22, Sept. 1949, p. 126-128, 130, 132, 134.

Tandem and follow dies designed for perforating and blanking operations.

**19A-208. How To Design Small Piercing Punches.** J. R. Paquin. *American Machinist*, v. 93, Sept. 8, 1949, p. 93-95.

At least one of the 14 types of punches sketched is believed suitable for almost any piercing operation, whether in low output or high-production dies.

**19A-209. Air Presses Punch Instrument Components.** John A. Muir. *American Machinist*, v. 93, Sept. 8, 1949, p. 98-99.

Accuracy, production, and operator efficiency were all increased when Sangamo Electric Co. substituted bench-type, air-cylinder presses for kick and hand presses. Staking, piercing, and burnishing operations are handled by standard subpress punch-and-die sets with small-scale tooling.

**19A-210. Cold Roll Formed Sections.** E. J. Vanderploeg. *Product Engineering*, v. 20, Sept. 1949, p. 134-138.

Use of standard equipment, formability of materials, and design in forming a variety of products from common metals.

## 19B—Ferrous

**19A-211. The Cold-Working of Metals.** C. H. Desch. *Engineering*, v. 168, Aug. 5, 1949, p. 137-139; Aug. 12, 1949, p. 161; Aug. 19, 1949, p. 175. A condensation. A rather extensive discussion of the structural mechanisms involved, including the polishing process.

**19A-212. Head, Wrightson Automatic Push Pointing Triple-Draw Tube Drawbench.** *Machinery* (London), v. 75, Aug. 11, 1949, p. 194-197.

Construction and operation of machine believed to be the first of its kind.

**19A-213. Progressive Piercing, Punching, and Forming Dies.** C. R. Cory. *Machinery* (London), v. 75, Aug. 25, 1949, p. 255-259.

Multiple dies for high-production requirements, die designs for producing complex-shaped parts, dies embodying cam action, and coil-feed drawing and blanking dies.

**19A-214. The Manufacture of Extruded Electrodes.** *Welder*, v. 18 (new ser.), Apr.-June 1949, p. 39-41.

**19A-215. Das Simultan-Tiefziehverfahren.** (The Simultaneous Deep-Drawing Process.) G. Oehler. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 199-205.

Compares the above, also known as the "telescope" process, with Auble's and conventional processes. Die arrangement for triple-step deep drawing, power consumption, drawing rates, control, and operating procedures. 12 ref.

**19A-216. Contour Forming.** *Aero Digest*, v. 59, Sept. 1949, p. 64, 102, 104.

Roto Contour Formers, developed by Cyril Bath Co. Typical applications.

**19A-217. The Use of Inclinable Punch Presses.** (Continued.) J. I. Karash. *Tool & Die Journal*, v. 15, Sept. 1949, p. 52-55.

Design of stripper plate suspensions, die design for inclinable presses, an elevated stationary stripper-plate die, and a piercing die. (To be continued.)

**19A-218. Short-Run Piercing of Holes by Fast, Economical Methods.** George H. DeGroat. *Machinery* (American), v. 56, Sept. 1949, p. 145-150.

Unusual devices employed to punch holes of various sizes and shapes for mounting condensers, relays, transformers, and other apparatus in panels for electrical equipment.

**19A-219. Cold-Swaging Hexagonal Nuts in a Punch Press.** F. W. Henke. *Machinery* (American), v. 56, Sept. 1949, p. 168-169.

**19A-220. Press-Forming Thin Sections: Effect of Friction, Area, and Thickness on Pressures Required.** William Schroeder and D. A. Webster. *Journal of Applied Mechanics*, v. 16 (Transactions of the American Society of Mechanical Engineers, v. 71), Sept. 1949, p. 289-294. Mathematical analysis and results of experimental determination of nondimensional ratios for various conditions of forging.

**19A-221. Theorie der bildsamen Formgebung.** (Theory of Plastic Forming.) E. Siebel. *Archiv für Metallkunde*, v. 2, no. 7, 1948, p. 248-252.

Reviews the literature. Principles of plastic deformation, mechanical technology of shaping processes and approximation methods for investigating the phenomena that accompany the forming process. Methods of computing slip, internal stresses, and plastic flow resistance. 37 ref.

**19A-222. Über Metaldrukerel und die Herstellung von Teilfuttern.** (Production of Chucks for Metal Spinning.) Richard Erdmann. *Metallarbeiter*, v. 1, sec. B, Aug. 1949, p. B72-B75.

Various shapes of these chucks; details of design and production.

**19B-164. Surface Strengthening by Cold Rolling.** *Metal Progress*, v. 56, Aug. 1949, p. 254, 256. Translated and condensed from "Measuring the Stresses and Plastic Deformations in Surface-Pressed Test Bars", Hayo Föppl, *Mitteilungen des Wohler-Institute*, no. 41, 1948, 67 pages.

Results of a thorough experimental investigation of hardening of cylindrical pieces by pressure rolling. Ninety tests were made on a spring and an alloy steel.

**19B-165. Production of Structural Shapes and Rails. Part I & II.** Frederick M. Gillies and Wilbur E. Dittrich. *Steel*, v. 125, Aug. 22, 1949, p. 82, 85-86, 88, 93-94, 96; Aug. 29, 1949, p. 74, 76, 78, 81, 82.

Three successful and efficient structural mills used today. Duties of the roller and roll designer in the successful production of many intricate sections. History of rails and their production from 1830 to date. Branding, end-hardening, and testing.

**19B-166. Torrance Plant Forges 'Kellys'.** *Western Metals*, v. 7, Aug. 1949, p. 22.

A "Kelly" is the metal link that transmits the driving power of an oil rig's engines to the string of drill pipe. Forging operations.

**19B-167. Straight-Line Production Emphasized at Lincoln Electric Co.** Walter Rudolph. *Modern Industrial Press*, v. 11, Aug. 1949, p. 20, 22, 24, 26.

A variety of press operations and equipment used in production of welding equipment.

**19B-168. Back-Pull Wire Drawing in Practice: Investigation Report.** J. G. Wistreich. *Wire Industry*, v. 16, July 1949, p. 573-575, 577.

An investigation under industrial conditions done on the prototype of a machine of novel design known as the "Pathfinder". Results revealed no important advantages of back-pull drawing, either with respect to power saving or increased die life.

**19B-169. The "Pathfinder" Machine: Description and Capabilities.** *Wire Industry*, v. 16, July 1949, p. 577, 579-580, 589.

Back-pull wiredrawing machine used in the experiments described in the preceding article. (See item 19B-168.)

**19B-170. The Manufacture of Metal Containers; Some Aspects of Production Procedure.** *Sheet Metal Industries*, v. 26, July 1949, p. 1439-1443.

Quality of tinplate, cost of handling, production control, container manufacture, cutting, stamping the bottoms and tops, defects in stamping, and curling. (To be continued.)

**19B-171. Le nouveau laminoir à froid de la fonderie Boillat S. A. à Reconvilier . . . Ein Neues Kaltwalzwerk der Fonderie Boillat Ag., Reconvilier.** (A New Cold Rolling Mill at the Boillat Foundry Co. in Reconvilier.) *Pro-Metal*, v. 2, June 1949, p. 421-426.

**19B-172. Die Blockstrasse im Edelstahl-Walzwerk.** (The Blooming Mill Train in the Alloy-Steel Rolling Mill.) Erwin Alfred Spenle. *Stahl und Eisen*, v. 69, June 23, 1949, p. 443-450.

Dimensions and position of the above from the standpoint of greatest possible economy, showing differences between ordinary and alloy-steel rolling mills.

**19B-173. Stamping and Enameling Improves Products.** Thomas A. Dickinson. *Steel Processing*, v. 35, Aug. 1949, p. 413-414, 434.

Equipment and procedures used with lightweight steel sheets.

**19B-174. Die Sinking for Drop Forging.** Part IV. Preparing the Blocks for

Sinking. John Mueller. *Steel Processing*, v. 35, Aug. 1949, p. 415-417, 444-445. Various operations involved.

**19B-175. Induction Annealing Simplifies Metal Forming.** L. R. Mueller. *Iron Age*, v. 164, Sept. 1, 1949, p. 69-71.

Use of induction heating to selectively soften sheet steel for forming operations permits use of hard sheets where proper tempers for forming are not available from stock. Case histories where high breakage rates and expensive salvage work have been overcome by use of this technique.

**19B-176. Geneva Rolls Steel Coil.** *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 88-89.

Procedure and equipment for rolling plates and coils.

**19B-177. Production of Butt and Lap Welded Pipe Conduit and Electric Metallic Tubing.** H. E. Engelbaugh. *Steel*, v. 125, Sept. 5, 1949, p. 92, 94, 97-98, 100, 103-104, 106, 109.

Development of pipemaking from its inception 5000 years ago up to present-day processes. All types with the exception of seamless tubes are discussed in detail. Principal procedures are forming, welding, and finishing. Nonferrous pipe is not considered.

**19B-178. Increasing Output by the Use of Carbide Lamination Dies.** *Machinery* (London), v. 75, Aug. 18, 1949, p. 219-221.

Used to produce rotor and stator laminations for electric shavers.

**19B-179. Das Schmieden von Walzen unter besonderer Berücksichtigung der hierfür verwandten Schmiedeeinrichtungen.** (Forging of Rolls, With Special Consideration to the Forging Equipment Required.) B. Wiele. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 205-207.

Development of forging presses, design and operation of a modern forging plant, the forging operation, and the forging of large rolls of carbon and chromium steel.

**19B-180. Rod and Billet Mill Highlights CF & I Modernization Program.** *Iron Age*, v. 164, Sept. 15, 1949, p. 78-79. New equipment of Minnequa Works, Pueblo, Colo.

**19B-181. Tungsten Carbide Tooling for Cold Heading. Part I.** W. E. Montgomery, W. Leigh, and W. H. Phillips. *Steel Processing*, v. 35, Aug. 1949, p. 407-412.

Characteristics of several tungsten carbide grades for cold heading. Procedure and variations. (To be continued.)

**19B-182. Keystone's New Rod Mill.** *Wire and Wire Products*, v. 24, Sept. 1949, p. 775, 787-788.

**19B-183. Die Making Techniques for Drawing Austenitic Stainless Steel.** William Slinkard. *Production Engineering & Management*, v. 24, Sept. 1949, p. 47-52.

Large savings in production costs in the fabrication of exhaust manifolds for internal combustion engines and also fuel manifolds, exhaust cones, combustion tubes, aft frames, and tail pipes for jet engines.

## 19C—Nonferrous

**19C-20. Rod and Section Extrusion; The Holford Works of I. C. I. Ltd., (Metals Division).** *Metal Industry*, v. 75, July 22, 1949, p. 63-67.

Procedures and equipment of above plant, products of which are copper-base extrusions.

**19C-21. Westinghouse Copper Wire Mill at Buffalo, N. Y.** Part I. *Wire and Wire Products*, v. 24, Aug. 1949, p. 686-689, 705-706.

Operations and methods in copper-wire production and insulated wire

and cable manufacture. Annealing and insulation.

**19C-22. Wire Manufacture; The Elliott Works of I.C.I. Ltd. (Metals Division).** *Metal Industry*, v. 75, Aug. 5, 1949, p. 103-106.

Equipment and procedures for production of copper and copper alloy wire.

**19C-23. Die Walztextur von Zink und Zinklegierungen und ihr Einfluss auf die technologischen Eigenschaften, insbesondere die Tiefziehfähigkeit.** (The Texture of Rolled Zinc and Zinc Alloys and Its Effect on Industrially Important Properties, Especially Deep Drawing Properties.) Wilhelm Hofmann and Bernhard Trautmann. *Zeitschrift für Metallkunde*, v. 39, Oct. 1948, p. 293-303.

Grain structures were determined by an X-ray method. Mechanical properties of sheets rolled by different methods were also determined. Results show that the method of rolling considerably affects the texture of a metal and, consequently, its mechanical properties. 19 ref.

## 19D—Light Metals

**19D-49. Aluminium Alloy Forgings; A Decade of Progress.** C. Wilson and J. W. Munday. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 83-89.

Present status and future trends. Heat treatment.

**19D-50. Multicellular Forms.** *Aircraft Production*, v. 11, Aug. 1949, p. 262-263.

Forming of multicellular structural sheet metal units on the drop hammer from various Al alloys. These units are designed to replace composite riveted assemblies made from sheet reinforced by channels, stiffeners, and gussets.

**19D-51. Giant Press Equipment Helps Produce Aluminum Stock at Permanente Metals Corporation.** Howard E. Jackson. *Modern Industrial Press*, v. 11, Aug. 1949, p. 30, 34, 36.

**19D-52. Stretch-Wrap Forming.** W. T. Kluge. *Light Metal Age*, v. 7, Aug. 1949, p. 10-13, 25.

Hufford machine which replaces the drop hammer and other stretching and forming machines in the North American Aviation plant. Al sheet is pre-stretched before the wrapping action takes place, providing a more uniform thickness and strength with minimum "spring-back". Forming data and physical properties. Includes an outline of experimental stretch forming of magnesium-alloy sheet at Texas Engineering and Mfg. Co., using similar equipment.

**19D-53. New Method Eliminates Handwork on Aluminum Aircraft Ducting; Saves Five Minutes Per Section.** *Light Metal Age*, v. 7, Aug. 1949, p. 17.

Advanced power-brake technique.

**19D-54. Stretch-Forms Magnesium in Experimental Aircraft Manufacture.** *Steel*, v. 125, Sept. 12, 1949, p. 122.

Stretch-forming of Mg alloy canopy frames for prototype models of the TE-1A military-type trainer.

**19D-55. Surface Orientation and Rolling of Magnesium Sheet.** Robert L. Dietrich. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 621-626.

A study of orientation, either during the rolling process or by treatment of the finished sheet, was made in an effort to improve bend properties and toughness. Surface orientation of AZ31X sheet can be improved by higher temperature, higher reduction per pass, and adequate lubrication during hot rolling with resultant improvement in bend properties and compression yield strength. The improved orientation persists to a re-

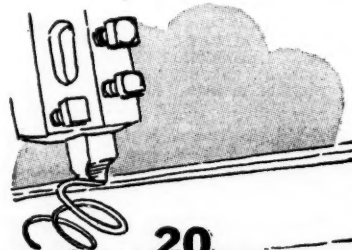
markable degree through subsequent annealing and cold rolling operations. X-ray reflection patterns illustrate results. 17 ref.

**19D-56. Densified Wood Dies Facilitate Forming of Aluminum.** James Milliken. *Machinery* (American), v. 56, Sept. 1949, p. 178-181.

Use for deep drawing and bending of Al, resulting in a more even distribution of metal and better surface finish.

For additional annotations indexed in other sections, see:

3B-182-193; 4C-103; 7C-38; 7D-42; 9-257



## MACHINING and MACHINABILITY

### 20A—General

**20A-365. Turn Miller: A New Machine for a New Process.** Roger W. Bolz. *Machine Design*, v. 21, Aug. 1949, p. 90-94.

Turn milling is defined as the generation of circular or cylindrical surfaces with a rotating milling cutter. Application to machining of crankshafts and similar parts where checking as well as turning is necessary.

**20A-366. New Developments in Microhoning.** Part II. Microhoning Equipment. Pat Qualtieri. *Western Machinery and Steel World*, v. 40, July 1949, p. 78-81, 100.

Properties and selection of abrasives and coolants. (To be concluded.)

**20A-367. Scrapers Made With Carbide Tool Tips.** *Iron Age*, v. 164, Aug. 25, 1949, p. 75.

Used for reconditioning and original finishing of machine tool slides, bearing, lathe ways, and other machine applications. Standard Carbo-loy cemented-carbide blanks can be brazed to old files, both round and flat, then ground by hand to desired shapes. These improved scrapers lasted many times longer than those formerly used.

**20A-368. Micro Tools Drill Tiny Holes.** J. A. Cupler, II. *American Machinist*, v. 93, Aug. 25, 1949, p. 76-78.

Equipment and procedures for precision drilling of extremely small holes with little or no drill breakage. Key to the process lies in continuous reciprocation of the drill point, lifting it clear of the work every few seconds, and in use of relatively low drilling speeds. As an example of possibilities, 7000 holes were drilled through 0.040-in. alloy steel with a single 0.0062-in. drill without breakage.

**20A-369. Practical Ideas.** *American Machinist*, v. 93, Aug. 25, 1949, p. 105-110.

Includes the following: table of cam dimensions simplifies jig and fixture design (Robert Mery); regrindable socket gage checks inserted-tooth saws (George W. Brown); jig plate and blanks clamped in

shaper vise (R. A. Lackmann); drill fixture clamps diminutive parts (H. Moore); emergency surface gage proves a valuable tool (H. C. Urbauer); tension spring substitutes for flat spring trip (Alfred Rheingold); caliper-indicator gages replace large micrometers (Michael P. Blake); machinists-scale adapters measure lengths to a thousandth (Rex Smith); hot drilling saves die steel (H. Boranini); small magnets replace tacks and tape on bulletin boards (Arthur A. Merry); chatter buster backs up rifle-turning tool (Don J. W. Tibbits); swing recessing tool converted for knurling (Otto V. Howe); hollow mill cuts spheres (Walter G. Holmes); spring toolpost handles wide forming cuts (F. E. Riley); boring-cutter set-up eliminates angle slotting (Lewis Welch); and other miscellaneous shop hints.

**20A-370. Turret Lathe Practice.** E. L. Murray. *Screw Machine Engineering*, v. 10, Aug. 1949, p. 42-47.

How to determine when it is necessary to apply standard, special, or combinations of both types of tools to a turret lathe setup. Examples of actual jobs.

**20A-371. The Production of Motors for Radiograms; Methods Employed by the Garrard Engineering and Mfg. Co., Ltd.** *Machinery* (London), v. 75, July 28, 1949, p. 111-118.

Machine-shop and blanking equipment used for production of phonograph motors.

**20A-372. Mandrels for Quantity Production.** Albert Maier. *Machinery* (London), v. 75, Aug. 4, 1949, p. 156-158.

In the tool-room, mandrels are often used where surfaces must be machined concentric with previously finished bores. Two forms are in common use. One is ground to a small taper, while the other comprises an accurately machined screw and nut. Such mandrels are not generally favored for quantity production on account of the time required for loading and risk of damage by unskilled labor. Different designs developed to overcome these objections.

**20A-373. New Developments in Microhoning.** Part III. Fixtures & Machines. Pat Qualtieri. *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 82-84.

Requirements of microhoning equipment and technique; size control; characteristics and types of microhoning machines.

**20A-374. Swiss Machine Tools; A Review of Modern Practice and Design.** *Automobile Engineer*, v. 39, Aug. 1949, p. 320-323.

**20A-375. Plugging Cylinder Liner Core Holes.** *Iron Age*, v. 164, Sept. 1, 1949, p. 76.

How core drilling, tapping, and driving 1-in. pipe plugs in diesel-engine cylinder liners is done on a 3-way, 4-station, hand-indexing machine.

**20A-376. Increased Production Through Better Use of Cutting Fluids.** William H. Oldacre. *Tool & Die Journal*, v. 15, Sept. 1949, p. 62, 64, 66, 69.

Mechanisms of metal cutting and lubrication. Possibilities of large improvements.

**20A-377. Hydraulic Chucking Devices for Lathe Applications.** Harry L. Stewart. *Product Engineering*, v. 20, Sept. 1949, p. 124-125.

Details of various types.

**20A-378. Contour Grinding 4000 Parts Per Hour.** *Steel*, v. 125, Sept. 5, 1949, p. 112.

Mass production of simple or intricate contours in small metal parts by a crush-grinding machine with automatic control.

**20A-379. Building Metering Pumps.** Fred W. Vogel. *Modern Machine Shop*, v. 22, Sept. 1949, p. 98-102, 104, 106-107.

Machine-shop procedures and equipment in production of rayon-metering pumps.

**20A-380. Carbide Tooling at New York Naval Shipyard.** J. G. Kenney. *Modern Machine Shop*, v. 22, Sept. 1949, p. 110-114, 116, 118, 120, 122.

Program for coordinated carbide control which enabled the New York Naval Shipyard to speed up production as much as 400% on some types of work.

**20A-381. New Machine Shop at Gulf Research Laboratories.** *Modern Machine Shop*, v. 22, Sept. 1949, p. 160-162, 164, 166, 168, 170, 172, 174.

Specialized metalworking facilities which serve large-scale experimental and related programs.

**20A-382. Modern Equipment at Work.** *Modern Machine Shop*, v. 22, Sept. 1949, p. 206, 208, 210, 212, 214, 216, 218, 220, 222.

Consists of the following brief articles: Machining 22-Ton Diesel Crankshaft Sections; Sheffield Precision-Aire for Gaging Cylinder Block Bores; Use of Portable Power Tools Reduces Assembly Costs; Thin-Walled Aluminum Castings Are Machined by Broaching; Savings From One Order Pays for Scully-Jones Automatic Recessing Tool.

**20A-383. Ideas From Readers.** *Modern Machine Shop*, v. 22, Sept. 1949, p. 224, 226, 228, 230, 232.

Consists of the following: "Cam Milling Fixture", Aaron H. Shum; "Handy Indicator Attachments", Edward Diskavich; "A Method of Indicating Gear Accuracy", Harting W. Babcock; and "Drafting Instruments Altered to Provide Easier Inking", A. H. Waychoff.

**20A-384. How Buick Tools up for Small Part Production.** B. S. Larzelere. *Iron Age*, v. 164, Sept. 8, 1949, p. 87-90.

Techniques employed in broaching, centerless grinding, burring, staking, and other operations in small-part production.

**20A-385. Shop Shots at IBM.** *American Machinist*, v. 93, Sept. 8, 1949, p. 96-97. Miscellaneous machine-shop equipment and procedures in manufacture of IBM equipment.

**20A-386. Practical Ideas.** *American Machinist*, v. 93, Sept. 8, 1949, p. 124-128.

Includes the following: drillpress and bench lathe combined into jig borer (Lowell F. Stull); taper locating pins shift to release welded assemblies (H. G. Frommer); stepped plug and shims help pre-set steady-rest jaws (Ray Cafiero); shop-built slide dresser features dove-tailed slide (Allan B. Nixon); set of riser clamps simplifies milling setups (Allan B. Nixon); taper adapter holds part and micrometer for measurements (Stanley R. Welling); knife-edged web locates centerpunch on layout (R. A. Lachmann); combination tool cuts off and turns (H. G. Frommer); and other miscellaneous shop hints.

**20A-387. Helical Gears Cut on "Solid Table" Machines.** No. III. Distribution and Amount of Errors. S. A. Couling. *Engineer*, v. 188, Aug. 12, 1949, p. 176-178.

A further source of error in gear cutting and a new machine, recently installed, which was designed to overcome the various errors as far as possible.

**20A-388. Practical Cutting Tools.** J. M. Lickley and A. J. Chisholm. *Machinery* (London), v. 75, Aug. 18, 1949, p. 222-229.

Previous articles dealt with the mechanism of the simplest cutting operations, namely, orthogonal and oblique cutting with wedge-shaped tools. There is considerable evidence for believing that, fundamentally, all cutting operations are based on the

action of simple wedge-shaped tools. Cutting forces, surface finish, and tool wear in relation to practical operations.

**20A-389. Grinding a Shallow Profile: a Description of a Trigonometrical Method.** H. J. Pearson. *Machinery* (London), v. 75, Aug. 18, 1949, p. 230-232.

Method applicable where specialized equipment such as an optical profile grinder or template-controlled diamond truing device is not available.

**20A-390. Electronic Control of Machine Tools.** S. A. Ghalib. *Engineering*, v. 168, Aug. 19, 1949, p. 173-174. A condensation.

Various examples.

**20A-391. Temperature of Cutting and Method of Its Determination.** (In Russian.) A. P. Gulyaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 717-723.

Method for approximate determination of cutting temperature at the contact point of the cutting tool and in adjacent regions. Application of the method resulted in development of certain qualitative relationships.

**20A-392. Electronic Contour Machining System.** *Iron Age*, v. 164, Sept. 15, 1949, p. 90.

Electronic instrument developed by General Electric.

**20A-393. Unusual Operations on Cylindrical and Centerless Grinders.** H. E. Balsiger. *Machinery* (American), v. 56, Sept. 1949, p. 151-158.

How standard grinding machines can be modified into specialized production machines capable of finishing many different materials in a wide variety of shapes. Unusual setups on centerless, plain, universal, and cam-grinding machines.

**20A-394. Determining Radial Clearance on Thread Milling Cutters Without Lead.** Sherwood C. Bliss. *Machinery* (American), v. 56, Sept. 1949, p. 158-160.

Geometrical method.

**20A-395. How to Estimate Milling Costs in the Job Shop.** Herbert W. Brown. *Machinery* (American), v. 56, Sept. 1949, p. 162-168.

Procedure for applying an estimating plan to horizontal milling jobs. Third of series.

**20A-396. Broaching "Christmas Tree" Slots in Jet-Engine Turbine Wheels.** *Machinery* (American), v. 56, Sept. 1949, p. 177.

**20A-397. Quick-Acting Slot-Drilling Jig.** H. Moore. *Machinery* (American), v. 56, Sept. 1949, p. 197.

Jig can be adapted for different sizes of shafts and slots merely by equipping it with various sizes of drill guides.

**20A-398. Fixture for Grinding Conical Shaft Ends Concentric With the Shaft.** Clifford T. Bower. *Machinery* (American), v. 56, Sept. 1949, p. 197-198.

**20A-399. Eight Spindle Double Index Chucking Machine Makes Part Completely by Machining Both Ends Simultaneously.** *Screw Machine Engineering*, v. 10, Sept. 1949, p. 27-30.

**20A-400. Carbide Tooling on Multiple Spindle Automatics.** *Screw Machine Engineering*, v. 10, Sept. 1949, p. 32-35.

Two jobs illustrate trends in carbide application to above.

**20A-401. Turret Lathe Practice.** E. L. Murray. *Screw Machine Engineering*, v. 10, Sept. 1949, p. 41-46.

Relation to other operations, maintenance of close tolerances, and special vs. standard tooling. Various holding devices.

**20A-402. Pitfalls to Avoid in Tooling Automatic Screw Machines.** Part Twelve. Noel Brindle. *Screw Machine Engineering*, v. 10, Sept. 1949, p. 48-51.

Broader use for Brown & Sharpe automatic screw machines by utilizing extra capacity turning and feeding movements and larger stock facilities.

**20A-403. Automatic Mechanically-Operated Milling Fixture.** R. Mawson. *Machinery* (London), v. 75, Sept. 1, 1949, p. 318-319.

**20A-404. Sur l'avantage du travail en compression des outils de coupe.** (Concerning the Advantages of Operating Cutting Tools Under Compression Forces.) Félix Eugène and René Dufaud. *Comptes Rendus* (France), v. 229, July 4, 1949, p. 53-54.

A comparative study of two modes of attachment of cutting tools: one with tool axis parallel and the other perpendicular to the applied force. Relation of rate of cutting to tool life and microstructure of surfaces obtained. The arrangement in which the tool works under compression resulted in increased tool life with no appreciable difference in quality of surfaces obtained.

## 20B—Ferrous

**20B-131. New Chemical Coolant Prevents Corrosion.** Karl F. Hager and Morris Rosenthal. *American Machinist*, v. 93, Aug. 25, 1949, p. 87-89.

Development of a German wartime process has produced a corrosion-inhibiting coolant effective in 0.2% solution in water. Test-sample photographs show lack of corrosion when the inhibitor is used.

**20B-132. Cutting Stainless by Friction Band Sawing.** H. J. Chamberland. *Iron Age*, v. 164, Sept. 1, 1949, p. 77-79.

Speeds and techniques for cutting solids and tubes, as well as limitations of the process.

**20B-133. Turn-Milling Crankshafts at High Production Rates.** Herbert Chase. *Automotive Industries*, v. 101, Sept. 1, 1949, p. 40-43, 68, 70.

How Cadillac machines crankpins, main-bearing journals, cheeks, and counterweights on latest equipment.

**20B-134. Gear Production: Investigation Into Problems of Cutting and Finishing.** H. Pearson. *Automobile Engineer*, v. 39, Aug. 1949, p. 311-315.

Variables are material to be cut; material of cutter; relief angles of cutter; top rake of cutter; surface finish of relieved and active surfaces of cutter; cutting speed; rate of feed; thickness of cut; and nature of coolant. Steel with 0.05% C was used throughout.

**20B-135. Saw Engineering Specialists.** Ralph G. Paul. *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 58-61.

Saw-conditioning equipment and its operation.

**20B-136. Giant Machine Functions as Miller and Planer.** *Steel*, v. 125, Sept. 12, 1949, p. 125.

Machine is capable of shaving a sliver 0.0001 in. thick from a steel block the size of a railroad box car.

**20B-137. Impact Milling with Cemented Carbide.** K. Lippacher. *Machinery* (London), v. 75, Aug. 11, 1949, p. 192-193.

Process and results for 0.45% carbon steel. Cutter design.

**20B-138. Latest Machining Methods Applied to Reo Gold Comet Engine Parts.** Joseph Geschelin. *Automotive Industries*, v. 101, Sept. 1, 1949, p. 32-37, 64; Sept. 15, 1949, p. 38-41, 58, 86.

Part I follows the cylinder head and block through their various machining stages, while Part II gives a sampling of operations on the piston, connecting rod, and crankshaft.

**20B-139. Internal Grinding Rate Doubled on Cam Rings.** *Iron Age*, v. 164, Sept. 15, 1949, p. 77.

Rates on cam-ring internal grinding have been doubled by use of a Heald Size-Matic centerless internal grinder in place of the chucking type previously used in production of Buick Dynaflo transmissions.

**20B-140. Locating Surfaces Broached Simultaneously.** *Production Engineering & Management*, v. 24, Sept. 1949, p. 64.

Close-tolerance machining of the crank end of automotive connecting rods and caps.

**20B-141. Broaching Solves Problem on Turbine Wheel Slots.** *Production Engineering & Management*, v. 24, Sept. 1949, p. 65.

How slots in Type 316 stainless steel gas turbine wheels are rough and finish cut to extremely close tolerances in one setup on a standard 10-ton American broaching unit.

## 20C—Nonferrous

**20C-18. Sintered Carbide Die Construction.** *Industrial Diamond Review*, new ser., v. 9, Aug. 1949, p. 232-233.

Procedure used by Allegheny Ludlum Steel Corp.

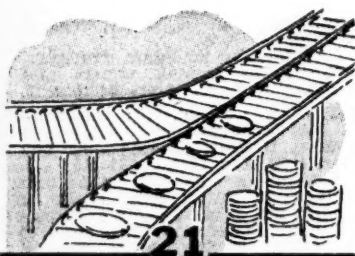
## 20D—Light Metals

**20D-18. Milling Complex Contours on Multiple-Spindle Machines.** *Machinery* (London), v. 75, Aug. 11, 1949, p. 198-199.

A 4-spindle automatic profiling machine and its operation applied to milling Al.

For additional annotations indexed in other sections, see:

21A-47



## MISCELLANEOUS FABRICATION

## 21A—General

**21A-45. Automatic Machines Assemble Condenser Coils.** *American Machinist*, v. 93, Aug. 25, 1949, p. 103.

Picture story shows how mechanization eliminates virtually all manual operations in assembling finned condenser units.

**21A-46. The Vital Role of Metals in Producing Electro-Medical Apparatus in the West.** C. J. Bircher. *Western Metals*, v. 7, Aug. 1949, p. 24-25.

A few miscellaneous fabrication procedures and equipment used in production of diathermy machines, electrosurgical instruments, ultraviolet lamps, and other electrical devices used in medicine. Principal alloys used are iron, steel, copper, and aluminum.

**21A-47. The Production of Automatic Record Changers; Methods Employed at the Garrard Factory.** *Machinery* (London), v. 75, Aug. 4, 1949, p. 147-154.

Machine-shop, and other miscellaneous fabrication and assembly procedures.

METALS REVIEW (48)

**21A-48. Australia Produces American-Designed Holden Car.** *American Machinist*, v. 93, Sept. 8, 1949, p. 132-134.

Miscellaneous fabrication procedures and equipment.

**21A-49. Compressed Air Power Facilitates Manufacture of Aircraft Engines.** *Steel*, v. 125, Sept. 12, 1949, p. 126.

Compressed air facilities which supply air to thousands of locations throughout the plant of Wright Aeronautical Corp. A battery of five compound, motor-driven compressors is used.

## 21B—Ferrous

**21B-51. Fracturing Connecting Rods to Assure Cap Alignment.** *Automotive Industries*, v. 101, Aug. 15, 1949, p. 33.

Connecting rod designed for small engines is in the form of a one-piece forging with a round crankpin hole, machined and hardened before parting the cap. The unique feature is that the cap is fractured from the rod in a controlled manner and the two parts then fit together in perfect alignment without machining of the parting surfaces.

**21B-52. Quarter-Mile Assembly Line for Truck Bodies.** *Automotive Industries*, v. 101, Aug. 15, 1949, p. 34-35, 64.

Equipment and procedures (welding, press operations, and assembly).

**21B-53. Closing the Bottle.** *Plating*, v. 36, Sept. 1949, p. 922-927.

Bottle-cap manufacture. Major operations are stamping, punching, shearing, coating, and plating.

**21B-54. Automatic Methods for Auto Mass Production.** *Production Engineering & Management*, v. 24, Sept. 1949, p. 53-60.

Miscellaneous procedures and equipment used in production of Buicks. Welding, forming, and machine-shop procedures are emphasized.

## 21C—Nonferrous

**21C-5. Making Money; How U. S. Mints Operate in Producing Coinage.** Leland Howard. *Mining Congress Journal*, v. 35, Aug. 1949, p. 36-40, 61.

Equipment and procedures, including molding, rolling, stamping, surface finishing, upsetting, etc.

**21C-6. Condenser Tube Manufacture: The Allen Everitt Works of I.C.I. Ltd. (Metals Division).** *Metal Industry*, v. 75, Aug. 19, 1949, p. 143-147.

British plant devoted to the manufacture of Cu-base alloy tubes. Casting, extrusion, tube drawing and reduction, annealing, heat treatment, and inspection are dealt with.

## 21D—Light Metals

**21D-11. The Brabazon Prototype: A Survey of Some of the Fabrication and Assembly Methods in Use on the World's Largest Aircraft. (Continued.)** A. W. Morgan. *Sheet Metal Industries*, v. 26, July 1949, p. 1473-1480, 1488; Aug. 1949, p. 1669-1677.

July installment: riveting procedures; heat treatment of rivets; the rear-body assembly; technology of the materials used (mainly the Al alloy DTD 364); and forming, machining, and welding of fuselage stringers. Aug. installment: manufacture and assembly of frame cleats and formers. (To be continued.)

**21D-12. Ship-Building and Light Alloy. (Concluded.)** *Light Metals*, v. 12, Aug. 1949, p. 439-449.

Summary of papers presented at recent symposium of Aluminum Development Association. Miscellaneous fabrication procedures and applications.

**21D-13. Unit Scaffolds of Aluminum.** *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 73-75.

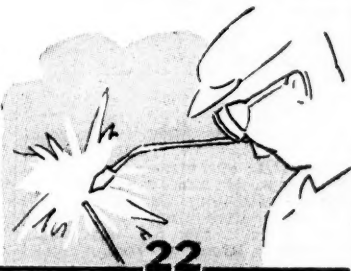
Fabrication methods.

**21D-14. The Production of Light Alloy Forgings and Stampings: Methods Employed at the Redditch Works of High Duty Alloys, Ltd.** *Machinery* (London), v. 75, Sept. 1, 1949, p. 295-300.

Casting, forming, and machine-shop procedures and equipment.

For additional annotations indexed in other sections, see:

24A-123



## JOINING and FLAME CUTTING

## 22A—General

**22A-184. Welding and Brazing.** David C. Martin. *Metals Review*, v. 22, Aug. 1949, p. 5-7, 14.

A survey of a year's literature shows a concentration of attention on procedures and techniques. References are to A.S.M. Review of Current Metal Literature.

**22A-185. A Survey of Modern Theory on Welding and Weldability. (Continued.)** D. Seferian. *Sheet Metal Industries*, v. 26, July 1949, p. 1511-1518, 1526; Aug. 1949, p. 1747-1754, 1760.

July installment: practical characteristics of metallic d.c. and a.c. arcs. Theory of the atomic-hydrogen arc and thermodynamic analysis of the atomic-hydrogen flame. Aug. installment: new and old methods for making arc welds. Ways to calculate weight of weld metal per unit length of arc weld, time per unit length, number of electrodes used per hour, and number of electrodes per kg. of deposited metal. (To be continued.)

**22A-186. Plastics in Engineering.** W. Nichols. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 68-78.

Assembly gluing technique using British synthetic resin adhesives for bonding metal to wood and metal to metal.

**22A-187. Welding Research.** H. Martin. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 85-87.

Various types of metallic arc welding. Developments in pressure welding and activities of the Welding Research Association.

**22A-188. Pressure Welding; Recent Developments in the U. S. A.** *Welding*, v. 17, Aug. 1949, p. 347-355.

A review. 16 ref.

**22A-189. Effect of Brazing Temperatures on Base Metal Properties.** S. Damon. *Iron Age*, v. 164, Aug. 25, 1949, p. 67-70, 114.

Effects of heating and cooling cycles encountered in furnace-brazing operations on as-cast and wrought nonferrous metals and wrought carbon and alloy ferrous metals are slighter than anticipated. Studies of an extensive series of both ferrous and nonferrous compositions.

**22A-190. Western Welder Fabricates Thin Gauge Containers.** *Western Metals*, v. 7, Aug. 1949, p. 23.  
Weld fabrication of thin-gage containers of aluminum, stainless steel, carbon steel, monel, and Inconel—in quantity and more economically than possible with deep drawing.

**22A-191. Selecting the Correct Electrode.** L. K. Stringham. *Sheet Metal Worker*, v. 40, Aug. 1949, p. 37-39, 102.  
Applied to arc welding of sheet metal.

**22A-192. The Nature of the Arc.** J. D. Cobine. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 6-17; discussion, p. 18.

Fundamental characteristics of the high-pressure short arc in general, which are applicable to the "welding arc" as well as to other arcs. Some obscure and little-known phenomena. Cathode-spot tracks on Al, Cu, and W are illustrated.

**22A-193. New Observations of the Welding Arc at Rensselaer Polytechnic Institute.** Lauriston P. Winsor. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 19-30; discussion, p. 31-32.

In connection with an investigation of welding-arc stability, several instruments have been developed for study of arc voltage and current, and power consumed. These are short-circuit counter, short-circuit duration indicator, and RMS deviation meter. Experimental results.

**22A-194. Arc Welding Equipment.** R. C. Freeman. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 46-49.  
Requirements of users.

**22A-195. A New Method for Studying the Behavior of High Current Arcs.** T. Benjamin Jones. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 50-55; discussion, p. 56-58.

Method consists of establishing an arc between two electrodes, one of which, in the form of a metal tape, is moved at a high speed relative to the other in the form of a rod. The track left by the arc on the tape forms a permanent record of the effects of the arc. This technique permits the power output of the arc at the moving electrode to be "spread out" in space and time under accurate control, so that certain cause and effect aspects of the process can be investigated.

**22A-196. Equipment and Techniques in Gas-Shielded Arc Welding.** Edward H. Roper. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 73-80.

Includes tabular guide to setting up for gas-shielded arc welding using tungsten electrodes, and schematic diagrams of equipment.

**22A-197. Equipment for Inert-Arc Welding.** A. U. Welch. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 81-85.  
Equipment and procedures.

**22A-198. Radio Interference Problems in Welding.** C. W. Frick. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 86-94; discussion, p. 95.

**22A-199. Frequency Converter Resistance Welding Machine.** J. F. Deffenbaugh, J. A. Kuzmack, and F. A. Trinkl. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 107-114; discussion, p. 115.

Preliminary report of experimental work being done to obtain data pertaining to frequency-converter-machine secondary-circuit parameters, secondary wave shapes, effect of the

parameters on wave shape, and effect of wave shape on welding ability of the machine. Tables and oscillograms for welding of various steels and Al alloys.

**22A-200. Resistance Welding With the Sciaky Three-Phase System.** J. L. Solomon. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 116-123; discussion, p. 124-132.

Advantages over other systems.

**22A-201. Application of Tri-Phase Metallic Rectifier Machines to Resistance Welding.** C. E. Smith. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 133-139.

The 3-phase circuit and welding characteristics.

**22A-202. Effect of Electrical Variations on Welding.** R. S. Phair. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 203-210; discussion, p. 211-212.  
A general discussion.

**22A-203. Present and Future Use of Resistance Welding.** J. H. Cooper. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 256-260; discussion, p. 261-262.

Economic status and future trends.

**22A-204. Welding and Metallizing—A Combination for Resurfacing.** Walter B. Meyer. *Industry and Welding*, v. 22, Sept. 1949, p. 30-31, 33, 36-39, 41.

**22A-205. Metal Bonding.** C. J. Moss. *Metal Industry*, v. 75, Aug. 12, 1949, p. 123-125, 132.

The Redux and Araldite processes for bonding metals to metal, wood, and plastic surfaces. The latter requires hardly any pressure while the former requires a lower temperature.

**22A-206. Characteristics of Effective Capacity and Efficiency of Contact Welding Machines.** (In Russian.) A. Z. Blitshteyn. *Avtozhennoye Delo* (Welding), Apr. 1949, p. 17-24.

Proposes a new nomographic method. Experimental data prove applicability of the method.

**22A-207. Portable Welding Unit for Contact Butt Welding.** (In Russian.) M. B. Eksler. *Promyshlennaya Energetika* (Industrial Power), v. 6, Apr. 1949, p. 11-12.

Unit is especially recommended for welding straight and curved tubes of 25 to 85-mm. diameter and wall thicknesses up to 4 mm. Operating characteristics for different tube diameters.

**22A-208. Der Fugenhobler und seine Anwendungsmöglichkeiten.** (The Groove Cutter and Its Applications.) H. H. Grix. *Schweissen und Schneiden*, v. 1, Mar. 1949, p. 35-44.

A special flame-cutting tool which prepares grooves in the metal. Applications.

**22A-209. The Welding Arc.** *Metal Progress*, v. 56, Sept. 1949, p. 376, 378, 380, 382. A condensation.

Previously abstracted from *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding". See item 22A-192, 1949.

**22A-210. Automatic Riveting Boosts Production of Small Parts.** *Machinery* (American), v. 56, Sept. 1949, p. 183.

Equipment designed for automatically riveting silver contacts to spring steel and bronze arms.

**22A-211. Welding Sheet-Metal Components of Turbo-Jet Engines.** George H. DeGroat. *Machinery* (American), v. 56, Sept. 1949, p. 184-189.

Rigid quality-control and precision welding methods employed in joining sheet-metal components of the "Turbo-Wasp" engine. (Second of two articles.)

**22A-212. Brazing and Soldering; Applications of Metal Powder Technique.** H.

W. Greenwood. *Metal Industry*, v. 75, Sept. 2, 1949, p. 191-192.

Advantages of powdered brazing and soldering alloys of both low and high-temperature types. Examples of successful applications.

**22A-213. Welding and the Future.** *Welding*, v. 17, Sept. 1949, p. 369-376.

Future trends are briefly discussed as follows: "Structural Engineering", D. J. Davies; "Aluminum Fabrication", E. G. West; "Aircraft Construction", H. Sutton; "Railway Engineering", H. G. Ivatt and A. H. Peppercorn; "The Chemical Industry", E. Fuchs; "Pressure Vessels", H. B. Fergusson and H. Harris; "Steel Fabrication", A. Robert Jenkins; "The Copper-Using Industries", L. Bernhardt; "Electrical Manufacturing Industries", C. F. Saunders; "Machinery Fabrication", R. C. Lightbourne; "Welding in the Future of Shipbuilding", Denis Rebeck; and "Trends in Research", H. G. Taylor.

**22A-214. (Book) Electric Arc and Resistance Welding.** 299 pages. May 1949. American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y. \$3.50.

Consists of 30 papers and accompanying discussion presented at a conference on electric welding in Detroit, Dec. 6-8, 1948. Pertinent individual papers are separately abstracted.

## 22B—Ferrous

**22B-305. Farm Equipment Manufacturing Methods and Costs Improved by Resistance Welding.** *Steel*, v. 125, Aug. 15, 1949, p. 97-100; Aug. 22, 1949, p. 64-67.

**22B-306. Cranes and Excavators.** *Welding*, v. 17, Aug. 1949, p. 334-340.  
Weld fabrication.

**22B-307. Welding Manipulators.** G. W. McCard. *Welding*, v. 17, Aug. 1949, p. 341-346.

Design and operation of three different types of special-purpose manipulators used in construction of heavy equipment.

**22B-308. Tank Wagon Repairs.** J. K. Johannessen. *Welding*, v. 17, Aug. 1949, p. 356-358.

Practical details of methods and techniques for welding damaged tank trucks.

**22B-309. Elevator Welding Positioner Doubles Production.** *Steel*, v. 125, Aug. 29, 1949, p. 86.

Welding a gland ring at top and bottom to a steel pump liner shell without removing it and without changing the level of the Unionmelt welding head.

**22B-310. Prefabricated Construction of Welded Steel Barges.** *Engineering*, v. 168, July 29, 1949, p. 104-105.  
At a British yard.

**22B-311. An Investigation Into the Factors Affecting the Adhesion of Vitreous Enamel to Arc Welded Mild Steel.** E. Bishop. *Sheet Metal Industries*, v. 26, Aug. 1949, p. 1755-1760.

Experiments made to determine causes of enamel defects on welded, thin-gage, mild steel sheet, and to determine welding techniques which would facilitate satisfactory enameling. The cause of blistering was found to be the evolution of atomic or molecular hydrogen, or water vapor. Methods of removal by heating and by the use of a special electrode. The welding of very thin mild steel sheet for enameling by use of a solid copper backing bar.

**22B-312. Cyclic Heating Test of Main Steam Piping Joints Between Ferritic and Austenitic Steels—Sewaren Generating Station.** H. Weisberg. *Transactions of the American Society of Me-*

chanical Engineers, v. 71, Aug. 1949, p. 643-649; discussion, p. 649-664.

It is concluded that sound welded joints can be made between these dissimilar materials and that such joints will withstand the effects of temperature changes which may be expected to occur in modern power-plant service.

**22B-313. Burn-Off Characteristics of Steel Welding Electrodes.** D. C. Martin, P. J. Rieppel, and C. B. Voldrich. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 33-43; discussion, p. 44-45.

See abstract of *American Iron and Steel Institute*, Preprint, 1949, item 22B-172, 1949.

**22B-314. Some Practical Spot Welding Comparisons: Single-Phase Vs. Three-Phase Converter.** F. L. Brandt, L. S. Wilkins, and R. T. Vredenburg, Jr. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 104-106.

Experimental results for spot welding of  $\frac{1}{8}$  or  $\frac{1}{4}$ -in. hot rolled steel.

**22B-315. Freight Cars From California.** *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 62-65.

Weld, flame cutting, and pressing procedure for fabricating freight cars.

**22B-316. Flash Welding of Wide Strip Steel.** F. R. Thompson and F. J. Waldschutz. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 35-39; discussion, p. 39-40.

Welding of wide strip for cold rolling has met with many difficulties. The flash welder described, combined with proper procedure, should eliminate many of these problems.

**22B-317. Projection Welding Speeds Gas Ranges.** Gerald Eldridge Stedman. *Welding Engineer*, v. 24, Sept. 1949, p. 17-19.

Production of cooking ranges features multiple welder with four transformers able to make 48 projection welds on the oven assembly in 5 sec.

**22B-318. Apex Prefabricates Structural Steel.** Fred M. Burt. *Welding Engineer*, v. 24, Sept. 1949, p. 20-23, 44.

Procedures, equipment, and products of Apex Steel Corp., Los Angeles.

**22B-319. "Squirt Gun" Welding of Huge Pipes.** H. Jackson. *Welding Engineer*, v. 24, Sept. 1949, p. 24-25.

"Squirt-gun" welding is the semi-automatic submerged-arc process. It offers many advantages for fabrication of pipe up to 10 ft. in diameter.

**22B-320. Tanker Gets New Midsection.** Margaret Ralston. *Welding Engineer*, v. 24, Sept. 1949, p. 28.

How a tanker was lengthened 30 ft. for civilian service by cutting it in two with torches and then welding into place a new midsection.

**22B-321. Carbon Arc Welds Cast-Iron Press.** William C. Henzlik. *Welding Engineer*, v. 24, Sept. 1949, p. 32-33.

Instead of the conventional oxy-acetylene method, the carbon arc was used to rejoin broken brackets to the cast-iron frame of a toggle drawing press. Important changes in procedure.

**22B-322. Gas-Welded Water Main.** Herbert Leopold. *Welding Engineer*, v. 24, Sept. 1949, p. 34-35.

Welding of 223-mile aboveground main used to supply an Australian desert town with water.

**22B-323. Cost Savers for Pipe Line.** R. G. Swisher. *Welding Engineer*, v. 24, Sept. 1949, p. 36-37.

How welded devices reduced cost and sped work in construction of a 24-in.,  $7\frac{1}{2}$ -mile gas main. Portable steel bridges were used to carry vehicular traffic over trenches. A welded crane positioned the pipe.

**22B-324. Tips on Tip Care.** D. S. Jones. *Welding Engineer*, v. 24, Sept. 1949, p. 38-40.

Practical recommendations for the flame-cutting operator.

**22B-325. Improved "Putting-On" Tool.** E. F. Davis. *Welding Engineer*, v. 24, Sept. 1949, p. 42.

Low-hydrogen-type electrodes, AWS E-6015, offer excellent possibilities when undersized parts have to be built up and then have threads turned on the deposited material.

**22B-326. Spot Welding Stainless Steel (AWS Recommended Practice).** *Welding Engineer*, v. 24, Sept. 1949, p. 49. Condensed from American Welding Society, Standard C1.1-46T.

**22B-327. Arc-Welded Beam and Column Framing.** Ned L. Ashton. *Progressive Architecture*, v. 30, Sept. 1949, p. 86-89.

Design details.

**22B-328. Fatigue Strength of Fillet-Weld, Plug-Weld, and Slot-Weld Joints Connecting Steel Structural Members.** Wilbur M. Wilson, William H. Munse, and Walter H. Bruckner. *Engineering Experiment Station, University of Illinois*, Bulletin Series No. 380 (Bulletin, v. 46, no. 68), May 1949, 104 pages.

Extension of work described in *University of Illinois Engineering Experiment Station*, Bulletin 350. Some specimens were designed to fail in the weld, others to fail in the plates or channels themselves. Some fillet-weld joints were single-pass welds; others were triple-pass welds.

**22B-329. Certain Problems in the Metallurgy of Automatic Welding of Type EYA-1T Steel Under Flux.** (In Russian.) K. V. Lynbavskii. *Avtogennoe Delo* (Welding), Apr. 1949, p. 1-7.

Steel is an 18-8 Cr-Ni austenitic type containing Ti. It was found that fluxes with a ratio of total basis oxides to total acids of about 1.2-1.35 and having additions reducing their viscosity in the molten state (CaF<sub>2</sub> and TiO<sub>2</sub>) possess completely satisfactory metallurgical properties. Attempts to use high-Ti fluxes did not result in marked improvement.

**22B-330. Automatic Welding of Type EYA-1T Stainless Steel.** (In Russian.) I. N. Gerasimenko and E. M. Lapitskaya. *Avtogennoe Delo* (Welding), Apr. 1949, p. 7-9.

The type of flux and electrode composition most suitable for 18-8 Cr-Ni steel (containing Ti) was investigated. The presence of at least 1.3% Cb in the electrode composition guarantees sufficient resistance of the weld metal to intercrystalline corrosion.

**22B-331. Investigation of Single-Pass Automatic Butt Welding of Type SXL2 Steel Under Flux.** (In Russian.) A. V. Obukhov and M. M. Kraichik. *Avtogennoe Delo* (Welding), Apr. 1949, p. 9-15.

Steel contains 0.16% C, 0.63% Mn, 0.35% Si, 0.72% Cr, 0.47% Ni, 0.45% Cu, 0.05% Mo, 0.003% S, and 0.02% P. Mechanical properties of welds obtained by above method were tested in bending, under Izod notch impact, and to rupture. Beneficial effect of annealing after welding and optimum conditions for this treatment.

**22B-332. Influence of Electrical Characteristics of Contact Welding Machines on Stability of the Welding Process.** (In Russian.) D. S. Balkovets. *Avtogennoe Delo* (Welding), Apr. 1949, p. 15-17.

Results of theoretical and experimental investigation indicate the relationships of stability to electrical characteristics. Methods of improving stability.

**22B-333. Erfahrungen mit dem geschweissten und nicht nachgegluhten Lokomotiv-Kessel; seine Berechnung und Herstellung.** (Experiences with Welded and Not Subsequently Annealed Locomotive Boilers: Their Design and Production.) R. Kühnel. *Schweissen und Schneiden*, v. 1, May 1949, p. 71-78.

Successes and failures of fillet and butt welding of locomotive boilers and their components. Optimum steel compositions.

**22B-334. How To Silver Braze and Solder Stainless Steel.** Lester F. Spencer. *Iron Age*, v. 164, Sept. 15, 1949, p. 69-74.

Alloys, standard specifications, fluxes and joint design, as well as part cleaning and joining techniques, for various types of stainless steels.

**22B-335. Gaseous Fluxes for Brazing Steel.** Alden P. Edson, Donald G. Paquette, and I. Laird Newell. *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 25-27.

Boron trifluoride is particularly attractive. Wetting and flow of molten brazing alloys are excellent, the quality of the brazed joint is exceptional, and there is no evidence of attack on the steel surface.

**22B-336. Pressure Vessel Production.** *Welding*, v. 17, Sept. 1949, p. 377-387. British plant for production of welded pressure vessels.

**22B-337. Automatic Welding for Carriage Construction.** Report No. 1: The Pullman-Standard Works. *Welding*, v. 17, Sept. 1949, p. 409-420.

## 22C—Nonferrous

**22C-25. Are You Welding Everdur?** *Industry and Welding*, v. 22, Sept. 1949, p. 19-22.

Fabrication and inert-arc welding of Everdur hot-water tanks.

## 22D—Light Metals

**22D-47. Argonarc Welding of Aluminum.** *Welding*, v. 17, Aug. 1949, p. 324-333.

Methods and equipment; special development work.

**22D-48. The Fabrication by Welding of Magnesium Alloys.** C. R. Kemp. *Modern Metals*, v. 5, Aug. 1949, p. 31-34.

The alloys used, equipment necessary, metal preparation, the welding process, and hazards.

**22D-49. Some Problems in Argon-Shielded Metal-Arc Welding of Thick Aluminum Plate.** R. D. Williams, P. L. Mirole, and C. B. Voldrich. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 59-65.

Five electrical problems: magnitude of the welding current; effect of rectification of the welding current; effect of high-frequency stabilization; effect of open-circuit voltage; and control of wire feed for mechanized welding.

**22D-50. Inert-Gas-Shielded Arc Welding of Aluminum.** G. O. Hoglund. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 66-72.

Costs, applications and advantages. Equipment and procedures.

**22D-51. Recent Advances in Single Phase Welding.** Ivar W. Johnson. *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding", May 1949, p. 96-101; discussion, p. 102-103.

Spot welding of 24S-T aluminum in thicknesses of 0.025, 0.040, 0.064, and 0.081 in. 52S Al 0.062 in. thick was also welded. Comparative results obtained with and without "slope control", showing great superiority of the latter.

**22D-52. Inert-Arc Helps Make Castings.** N. D. O'Daniell. *Welding Engineer*, v. 24, Sept. 1949, p. 26-27.

Manufacture of a magnetic device for separating metallic particles from machine-tool coolants. Material used is cast aluminum and five parts are welded together.

**22D-53. Der Einfluss der Schweißzeit beim Punktschweißen von Aluminiumlegierungen.** (The Effect of Welding Time on the Spot Welding of Aluminum Alloys.) Friedrich Erdmann-Jesnitzner. *Zeitschrift für Metallkunde*, v. 39, Oct. 1948, p. 303-312; discussion, p. 312-313.

Effects of welding time and amperage on strength properties and structures of the welds in six different Al-Mg alloys were determined. Metallographic examination shows that the tendency to cracking and pore formation increases with the Mg and Mn contents of the alloys, while Si has the opposite effect. Results using an improved welding rod. 28 ref.

**22D-54. Die Hartlötung von Leichtmetallen unter besonderer Berücksichtigung der Plattierlötung.** (Hard-Soldering Light Metals With Special Reference to the "Plate-Soldering" Process.) E. Blohm. *Metall*, Nov. 1948, p. 365-370.

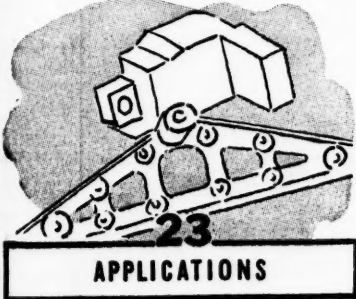
The Zarges "plate-soldering" process for attaching curved sections to flat plates.

**22D-55. Heliwelding Aluminum Trailer Roofs.** *Iron Age*, v. 164, Sept. 15, 1949, p. 87.

**22D-56. Le collage des alliages légers.** (Bonding Light Alloys.) (Continued.) Pierre Prévot. *Revue de l'Aluminium*, v. 26, May 1949, p. 163-169; June 1949, p. 209-215.

May: apparent fracture fatigue depends on the joint factor. Chart provides a means of rapid calculation of the resistance of a single lap joint. Fatigue tests show that adhesive-bonded joints have better resistance than the metal alone to alternate stresses and strains; after 5 million alternations, ruptures always occur in the metal. A comparison with riveted or spot welded assemblies indicates the value of bonding for light alloys, especially in the small gages. June: an analysis of advantages and disadvantages of adhesive bonding as compared with other methods. Reviews the principal modern adhesives. (To be continued.)

For additional annotations indexed in other sections, see: 7B-177; 12-177; 13-55; 15-64; 19A-194-214; 19B-167-177



## APPLICATIONS

### 23A—General

**23A-25. Metals in Clock and Instrument Manufacture.** R. E. Tricker. *Journal of the Institute of Metals*, v. 75, July 1949, p. 881-898.

The various ferrous and nonferrous alloys used for turned parts, die castings, pressed and blanked parts, spring materials, magnet alloys, and alloys with special applications.

**23A-26. Expanded Metal Growing in Popularity.** *Sheet Metal Worker*, v. 40, Aug. 1949, p. 48-50.

Wide variety of applications of expanded metal, which is essentially

heavy-gage screening with a diamond-shaped pattern made by slitting ordinary sheet metal, then stretching it so the slits become diamond-shaped holes.

**23A-27. Magnetic Fluid Uses.** *Electronics*, v. 22, Sept. 1949, p. 120, 122, 158, 160, 162, 164, 166.

Recent studies of iron-oil mixtures used in the electromagnetic fluid clutch developed by the National Bureau of Standards reveal that magnetic fluids can be employed to good advantage in hydraulic systems, shock absorbers, and dash pots, to form casting molds and as variable electrical resistors.

**23A-28. Sleeve Bearing Development.** Albert B. Willi, Jr. *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 68-73; discussion, p. 73-74.

Recent developments in bearing lining and backing materials, bearing material combinations, and manufacturing methods. Relative bearing costs, typical installations, and average bearing life.

### 23B—Ferrous

**23B-45. Steel Buildings Speed Western Plant Expansions.** *Western Metals*, v. 7, Aug. 1949, p. 19-21.

**23B-46. Characteristics of the Materials Involved in the Magnetic Fluid Clutch.** H. D. Saunderson. *Proceedings Fifth Annual Meeting, Metal Powder Association*, 1949, p. 93-101; discussion, p. 102, 106.

Properties and applicabilities of the metallic powders, the fluids, and the surface-active agents used as the power-transmitting media in the clutches. Includes photomicrographs of carbonyl iron powders dispersed in mineral oil, magnetically aligned and free moving. Applications of the clutches.

**23B-47. Light-Gage Steel Offers New Building Opportunities.** B. L. Wood. *Engineering News-Record*, v. 143, Sept. 1, 1949, p. 203-205.

Several applications. Design principles.

**23B-48. Some Notes on the Use of Heat-Resisting Steel Refractories on Glass Works.** H. M. Bateson. *Journal of the Society of Glass Technology (News and Reviews Section)*, v. 33, Apr. 1949, p. 75.

Possible applications of steel refractories for certain parts which come in contact with molten glass, as a substitute for the refractory materials generally used. The slight extra cost is more than compensated for by increased life and strength. Steel feeder needles, orifice rings, and forehearth cover tiles have given good service.

### 23C—Nonferrous

**23C-51. California Glamorizes Copper; Application to Brick and Tile Creates Unusual Decorative Effects.** *Sheet Metal Worker*, v. 40, Aug. 1949, p. 35-36. New technique.

**23C-52. The Applicability of Ceramics and Ceramals as Turbine-Blade Materials for the Newer Aircraft Power Plants.** A. R. Bobrowsky. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 621-628; discussion, p. 628-629.

Tensile, flexure, thermal-shock, and oxidation data at temperatures up to 2400° F. Results of turbine-blade operation at the NACA Cleveland laboratory. 10 ref.

**23C-53. What Beryllium Copper Offers the Designer.** John T. Richards. *Machine Design*, v. 21, Aug. 1949, p. 117-123. Properties, fabrication procedures, and applications.

**23C-54. Les métaux précieux dans l'industrie.** (Precious Metals in Industry.) E. M. Wise. *Métaux et Corrosion*, v. 24, Apr. 1949, p. 87-117.

Methods of production and chemical and mechanical properties (particularly corrosion resistance) of a series of precious metals. Main spheres of possible industrial application are indicated. 56 ref.

**23C-55. Die Castings in the Automotive Industry: The Electrical System.** *Die Castings*, v. 7, Sept. 1949, p. 21-23.

Miscellaneous examples which include switch housings, connectors, and bells, horns, lamp housings, etc.

**23C-56. Die Castings in the Automotive Industry: The Fuel System.** *Die Castings*, v. 7, Sept. 1949, p. 24, 30.

**23C-57. Die Castings in the Automotive Industry: Service Equipment.** *Die Castings*, v. 7, Sept. 1949, p. 27-28.

Illustrated by description of zinc die-cast gasoline pump components.

**23C-58. Die Castings in the Automotive Industry: The 1949 Oldsmobile.** *Die Castings*, v. 7, Sept. 1949, p. 36-38, 66-69.

Miscellaneous die castings in this car.

### 23D—Light Metals

**23D-86. Aluminum School Furniture.** *Modern Metals*, v. 5, Aug. 1949, p. 18-19.

**23D-87. Something New in Buildings.** *Modern Metals*, v. 5, Aug. 1949, p. 20.

Unique feature of office building is vertical aluminum fins for shading the south and west windows.

**23D-88. Gas Engine Powers Portable Unit.** John L. Ryde. *Machine Design*, v. 21, Aug. 1949, p. 106-108.

Use of magnesium die castings in portable chain saw.

**23D-89. Light Alloys in the Petroleum Industry.** (Continued.) *Light Metals*, v. 12, July 1949, p. 372-381.

Aluminum paint; use of Al foil for storage tanks; importance of Al in storage-tank construction. 23 ref. (To be continued.)

**23D-90. Light Alloys in Mail and Phone Services.** *Light Metals*, v. 12, Aug. 1949, p. 450-451.

Telegraph and telephone-pole cross-arms and private post-office boxes.

**23D-91. Emploi des alliages d'aluminium sur les wagons pour transport de charbon.** (Use of Aluminum Alloys in Railway Coal Cars.) Jean Hérenquell. *Revue de l'Aluminium*, v. 26, June 1949, p. 195-201.

Results of experimental tests in which side panels were replaced by "Durcillum" and "Alumag 50" panels. Examination after 21 months' service revealed that the panels had not suffered from corrosion. Mechanical resistance to shocks was good.

**23D-92. Aluminum Moves Ahead in Building.** *Light Metal Age*, v. 7, Aug. 1949, p. 14-15, 20.

New structural applications—office buildings and tanks.

**23D-93. Aluminum Die Cast Door Frame Cuts Costs for Kaiser-Fraser Corp.** *Light Metal Age*, v. 7, Aug. 1949, p. 16-17.

**23D-94. Some Aluminum Uses at the Paris Automotive Exhibition.** Maurice Victor. *Modern Metals*, v. 5, Aug. 1949, p. 22-25. Translated from *Revue de l'Aluminium*.

**23D-95. Die Castings in the Automotive Industry: Structural Members.** *Die Castings*, v. 7, Sept. 1949, p. 31-33.

Die-cast Kaiser-Fraser door frame in aluminum. Other possibilities.

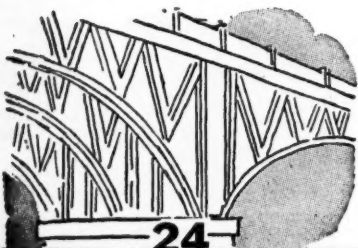
**23D-96. Metal Type Reflective Insulations Prove Themselves.** James G. Macormack. *Refrigerating Engineering*, v. 57, Sept. 1949, p. 885-889, 922.

Installation of Alumiseal for vari-

ous refrigerating applications. Advantages of this method of insulation.

For additional annotations indexed in other sections, see:

3A-195; 3B-188; 3C-166-175; 3D-56; 6B-135; 7C-35; 8-238; 14A-118; 14C-76



## DESIGN

### 24A—General

**24A-120. High Pressure.** *Chemical Engineering*, v. 56, Aug. 1949, p. 107-123. Designs and engineering used in today's high-pressure plants. Fabrication methods, metallurgical problems, and instrumentation. Restricted to equipment for pressures of 750 psi. and higher.

**24A-121. Limits and Tolerances.** *American Machinist*, v. 93, Aug. 25, 1949, p. 121, 123, 125.

Summary of the specification of limits and tolerances and methods of indicating them on drawings.

**24A-122. Production Processes—Their Influence On Design.** Part XLV. Sand Casting. Roger W. Bolz. *Machine Design*, v. 21, Aug. 1949, p. 127-140. Design principles.

**24A-123. Production—the Designer's Contribution.** Part I. Principles of Efficient Production; Special Problems of Manufacture; Joining Processes. Frank Radcliffe. *Aircraft Production*, v. 11, July 1949, p. 241-245.

Manufacturing costs and the contribution that the designer can make to economy. Special problems of air-frame manufacture and current British production practice. Possible future developments, both in design and manufacture. 12 ref. (To be concluded.)

**24A-124. The Effect of Tolerances on Fits.** J. Gilson. *Machinery* (London), v. 75, July 28, 1949, p. 119-124.

First of a series of four concerned with controversial aspects of the subject, primarily from the point of view of the producer and with particular reference to the manufacture of light engineering products. (To be continued.)

**24A-125. Die Grenzzustände statisch beanspruchter Stoffe.** (Limiting States of Statically Stressed Materials.) C. Torre. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Apr. 1949, p. 116-121.

A theoretical treatise on limiting stresses, stress-expansion characteristics, spontaneous stress relief of the material, the mechanics of elastic-plastic and purely plastic deformations, and the different types of stress. (To be concluded—see item 24A-102, 1949.)

**24A-126. Beanspruchung bei mehrfacher Kerbwirkung, Entlastungs- und Ueberlastungskurven.** (Stress With Multiple Notches, Stress-Decreasing and Stress-Increasing Notches.) A. Thum and O. Svenson. *Schweizer Archiv für angewandte Wissenschaft*

*und Technik*, v. 15, June 1949, p. 161-174.

The complex effects of more than one notch on the strength properties of structural parts. 13 ref.

**24A-127. Die Wirkung von Kerben bei schwingender Beanspruchung.** (The Effect of Notches During Application of Vibrating Stress.) E. Siebel and H. O. Meuth. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, July 1, 1949, p. 319-323.

A working hypothesis for the strength behavior of unequally stressed structural parts, subjected to alternating multiaxial stresses, and a method for calculating the stress-strain gradient of notched steel bars.

**24A-128. Press Fit Seals for Ball and Roller Bearings.** E. P. Stahl. *Iron Age*, v. 164, Sept. 8, 1949, p. 69-74.

Various springless and spring-loaded unit oil and grease seals that can be press fitted without counter-boring. Miscellaneous applications.

**24A-129. How Codes Affect Pressure Vessel Design.** Neil Osborn. *Machine Design*, v. 21, Sept. 1949, p. 105-106.

Requirements of the various agencies, including those responsible for codes.

**24A-130. Accurate Calculation of Static Bending Strength.** Stanley J. Weiss. *Product Engineering*, v. 20, Sept. 1949, p. 94-97.

Theory of limit design, which considers yielding of the material and determines the static strength of flexural members more accurately than standard stress-analysis procedures. Application to members subject to both axial load and bending moment.

**24A-131. Effect of Tolerance Accumulation on Assemblies.** J. Gilson. *Machinery* (London), v. 75, Aug. 11, 1949, p. 188-191.

A mathematical analysis of the probable variation in an assembly dimension controlled by a number of individual tolerances.

**24A-132. The Forming of a Plastic Sheet Between Fixed Cylindrical Guides With Coulomb Friction.** H. I. Ansoff. *American Society of Mechanical Engineers, Paper no. 49-SA-22*, June 1949, 20 pages.

An investigation to obtain a rigorous analysis of the drawing of a plastic sheet (material in a state of plane plastic flow) between two fixed cylindrical surfaces. 10 ref.

**24A-133. Primary Creep in the Design of Internal-Pressure Vessels.** L. F. Coffin, Jr., P. R. Shepler, and G. S. Cherniak. *Journal of Applied Mechanics*, v. 16 (Transactions of the American Society of Mechanical Engineers, v. 71), Sept. 1949, p. 229-241.

Previously abstracted from *American Society of Mechanical Engineers, Advance Paper No. 48-PET-18*. See item 24a-239, 1948.

**24A-134. The Theory of Plane Plastic Strain for Anisotropic Metals.** R. Hill. *Proceedings of The Royal Society, ser. A*, v. 198, Aug. 22, 1949, p. 428-437.

A yield criterion and plastic stress-strain relations are formulated for anisotropic metals, deformed under conditions of plane strain. Theory is applied to the problem of indentation by a flat die.

### 24B—Ferrous

**24B-39. The Future of Structural Engineering in Relation to Steel Railway Bridges.** Shortridge Hardesty. *Proceedings, American Railway Engineering Association*, v. 50, 1949, p. 877-881.

Bridge specifications, AREA-sponsored research, and the problems of fatigue and protection against corrosion.

**24B-40. Effects of Sharp Radii and Other Features of Design.** *BSFA Bulletin*, v. 1, April 1949, p. 1-7.

Provisions in design to prevent cooling from affecting the strength and soundness of steel castings.

**24B-41. Experimental Investigation of Rim Cracking in Disks Subjected to High Temperature Gradients.** P. I. Wiltedink. *National Advisory Committee for Aeronautics, Research Memorandum E9F16*, Sept. 1, 1949, 45 pages.

Investigation of cracking in a welded-blade composite gas-turbine wheel, in two carbon-steel disks, and in five toolsteel disks. In order to determine the effectiveness of holes in preventing crack propagation,  $\frac{1}{8}$  and  $\frac{1}{4}$ -in. diameter holes were drilled in the rim. The effectiveness of the holes in preventing crack growth was difficult to estimate accurately. Influence of hardness and various types of notch was investigated by subjecting 13.5-in. disks to thermal stress cycles.

### 24D—Light Metals

**24D-14. Formule et abaque pour la détermination des intensités admissibles dans les barres, tubes et profilés en Aluminium et alliages d'Aluminium.** (Formula and Graphs for Determination of Allowable Stresses in Aluminum and Aluminum Alloy Bars, Tubes, and Shapes.) Pierre Chapouille. *Revue de l'Aluminium*, v. 26, June 1949, p. 206-208.

Modified Melson and Booth derivation of formula and chart applicable to a large range of dimensions and to a wide variety of Al alloys.

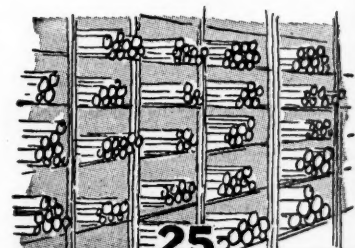
**24D-15. Big Die Casting Cuts Cost of Automobile Door.** *Product Engineering*, v. 20, Sept. 1949, p. 111.

One-piece aluminum die casting for Kaiser-Frazer car doors reduces assembly costs and car weight.

**24D-16. How To Design Aluminum Bridges.** D. B. Steinman. *Engineering News-Record*, v. 143, Sept. 1, 1949, p. 198-202.

For additional annotations indexed in other sections, see:

14A-124; 19A-207-208-217; 23B-47



## MISCELLANEOUS

### 25A—General

**25A-121. Réactivité des corps solides; Applications techniques actuelles et perspectives d'avenir.** (Reactivity of Solids; Existing Technical Applications and Future Prospects.) J. Arvid Hedvall. *Bulletin de la Société Chimique de France*, Mar.-Apr. 1949, p. D238-D250.

The present status of knowledge and practical application. Importance of results obtained by mag-

(Turn to page 54)

# EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is

restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

## POSITIONS OPEN

### East

**SALES ENGINEER:** Eastern utility converting to natural gas has opening for engineer for the promotion of gas fuel in industrial plants. Must be familiar with the economics of natural gas as compared with competing fuels and qualified to recommend gas equipment for various industrial heating processes. At least five years' experience in this type of work required. In reply, please give age, education, experience, and salary desired, and enclose recent snapshot. Box 10-5.

**YOUNG COLLEGE GRADUATE:** Preferably with degree in metallurgy, to be assistant to the welding engineer in a large shipyard. Work involved would be largely experimental and development, and integrating findings with production. Opportunities for advancement are good for the right type of man. Box 10-10.

**METALLURGICAL ASSISTANT:** For development and control work in precious metals and nonferrous metals. Must have imagination, resourcefulness and mechanical ability. Splendid opportunity for advancement in small progressive organization in New York City. Both recent graduates and those with experience will be considered. State full qualifications and starting salary requirements. Box 10-15.

**TECHNICAL SALES AND SERVICE:** Man with metallurgical and chemical training and some industrial experience in the metalworking industry. Familiarity with the field of lubrication desirable. Age 30 to 35. Good starting salary and excellent chance for advancement with well-established basic company. Box 10-20.

**SALESMAN:** To represent nonferrous foundry in the New England area. Salary and bonus. Box 10-25.

**PLANT SUPERINTENDENT:** Responsible for foundry, machine shop and finishing department, nonferrous. Should have some successful experience in labor-management negotiations. Prefer college training in metallurgical or mechanical engineering. Box 10-30.

### Midwest

**ROLL DESIGNER:** With practical experience in toolsteel and specialty rolling. Must be capable of handling administrative duties of rolling mills. Box 10-35.

**WELDING ENGINEER:** Graduate engineer with practical welding experience. Must be familiar with all phases of welding, particularly resistance welding and inert gas welding. Work will involve supervision and manufacturing development. Excellent job in an interesting field. State qualifications fully. Box 10-40.

**SALES MANAGER:** Steel warehouse, Cleveland area. Alloy bars, hot rolled and cold finish, also tool and die steels. Exceptional opportunity. Salary and overwriting. Write fully. Box 10-170.

### West Coast

**DISTRICT SALES MANAGER:** Pacific northwest. Knowledge of electric welding. Willing to travel extensively in own car. Working with and educating distributors selling nationally known steel products for maintenance and repair of construction, mining, quarry equipment. Salary and commission. Write qualifications. Box 10-45.

## POSITIONS WANTED

**METALLURGIST:** Five years' experience in fabrication and development involving ferrous and nonferrous metals. Included materials substitution, evaluation of high temperature alloys, mechanical testing, heat treatment and metallography. Desires responsible position in development or metal fabrication. B.S. in 1943; M.S. in metallurgy in 1950. Age 29. Resume on request. Box 10-50.

**METALLURGICAL ENGINEER:** B.S. this year. Primarily interested in ferrous metallurgy. Would like position in company with training program and opportunity for advancement. Presently employed as melter in stainless steel foundry. Box 10-55.

**METALLURGICAL ENGINEER:** Age 39, married. 5½ years experience in gas turbine production, working principally with high-temperature alloys. Desires responsible position in high alloy field—engineering or development. Presently active in administrative position. Location not important. Box 10-60.

**RECENT METALLURGICAL ENGINEERING GRADUATE:** From large mid-western university. Veteran, age 25, married, two children. A little gray iron experience. Desires start in sales or production that will lead to responsible position in company that promotes from within. Available now. Box 10-65.

**STAINLESS STEEL SPECIALIST:** In metallurgy and sales development, desires connection with progressive company. Age 38, married. Outstanding metallurgical record in manufacture and fabrication of stainless steel bar, wire and sheet products. Author of a number of published papers. Pleasing sales personality combined with real metallurgical knowledge. Box 10-70.

**METALLURGICAL ENGINEER:** Available for control of materials and plant processes; prepare purchase specifications and standard practices; supervise chemical, physical, metallographic testing; investigate complaints. Well informed on foundry practice, melting, molding, heat treating, welding. All metals, tool materials, lubricants. M.S. degree, 13 years' industrial experience. Chicago area preferred. Box 10-75.

**SECRETARY:** Are you a busy executive who needs a real private secretary? B. Met. E. Experience includes metallurgical factory and laboratory control, office manager, private secretary, legal stenographer. Free to travel. Adaptable and industrious. New Jersey metropolitan area preferred. Box 10-80.

**SUPERVISING METALLURGIST:** B.S. degree. 20 years' experience in metallurgical fields. 15 years' supervision of laboratory, heat treatment, metal specification, failure investigation, general metal processing. Familiar with ferrous and nonferrous processing, metallography, physical testing, quality control and related fields. Desires change due to present limitations. Age 46, married. Box 10-85.

**HEAT TREATER:** 11 years' diversified experience in toolroom and production heat treating using salt bath, gas, electric furnaces. Seven years as supervisor. Extensive experience in carburizing, alloy, carbon, tool and high speed steel. Some knowledge of pyrometry. Married, age 41. Prefers Michigan or Ohio but will relocate. Box 10-90.

**METALLURGICAL ENGINEER:** Recently arrived in this country from Germany. Experienced in steel and powder metallurgy field, and also with nonferrous metals with the exception of aluminum. Both production and laboratory experience. Planning engineer for construction of sponge iron powder plant. Box 10-95.

**METALLURGIST:** ScD., with 12 years' practical steel mill experience in tool, alloy, high speed and stainless steels; six years of college teaching, several publications and patents. Now employed, but desires change of employment. Box 10-100.

**METALLURGICAL ENGINEER:** B. S. in metallurgical engineering. Age 39. Thirteen years' experience with large steel fabricator, Bureau of Ships and Naval shipyards in planning and directing welding research and development, preparation of technical reports, specifications, procedure control, and in supervising laboratory personnel in connection with design and fabrication of pressure vessels, piping, heavy weldments, ships machinery and structure. Box 10-105.

**YOUNG COLLEGE GRADUATE:** B.S. in metallurgical engineering desires position as assistant to foundry superintendent or will accept training program. Five years' experience in ferrous and nonferrous foundry in laboratory. Has supervised chemical and spectrographic analysis and X-ray; sand testing; metallography; foundry laboratory procedures. Married and presently unemployed. Box 10-110.

**PLANT MANAGER:** Broad background in fabrication of metal parts and assemblies, and heavy chemical processing. Experienced in supervising metallurgical, mechanical, chemical, and industrial engineers. Proven ability in cost reduction and establishing efficient, smooth-running organizations. Box 10-115.

**RESEARCH METALLURGIST:** B.S., M.S. in metallurgical engineering. Age 23. Research experience. Best of references. Desires position involving research in the physics of metals or physical metallurgy. No preference as to location. Box 10-120.

**METALLURGICAL-MECHANICAL ENGINEER:** Desires production or development position requiring knowledge of ferrous, nonferrous, or powder metallurgy. Veteran, age 26. M.S. and mechanical engineering degrees from Stevens Institute of Technology. 1½ years' industrial experience in metallurgical research laboratory; 1½ years as instructor of metallurgy for eastern college. New Jersey or New York preferred. Box 10-125.

**OPENHEARTH METALLURGIST OR RESEARCH ENGINEER:** B.S. and M.S. in metallurgical engineering. Age 33, married, two children. 11 years' experience in teaching, production and research work of basic and acid openhearth. Two years' experience in manufacture of steel rolls. Served as supervisor in charge of openhearth. Five years as senior research engineer on acid openhearth. Two years' basic openhearth pit foreman and two years' teaching metallurgy. Box 10-130.

**METALLURGIST:** Age 31, married. Eight years of practical experience and training in metallography, physical testing, inspection, research, fabrication, and heat treatment of ferrous and nonferrous alloys. Desires position in development and research or production. Midwest preferred. Complete resume of experience on request. Box 10-135.

**METALLURGIST:** Broad practical experience in melting, processing, fabrication and technical development of stainless and alloy steels. Organizational-administrative ability. Systematic, cooperative and tactful worker. 22 years' association with leading steel producers and excellent references. Desires position as plant metallurgist, management assistant with special responsibility for high efficiency, quality control and customer satisfaction. Box 10-140.

**METALLURGICAL ENGINEER:** B.S.E. in chemical engineering and M.S.E. in metallurgy. 14 years' diversified experience in steel mill, heat treatment, malleable foundry, college teaching, and research in ferrous and nonferrous alloy development. Desires responsible position in development, research or production. Location immaterial. Registered professional engineer. Age 38, married, family. Box 10-145.

**METALLURGICAL ENGINEER:** B.S. from Case Institute of Technology. Two years' experience in production control and development work with nonferrous metals. Seeks position with Midwest firm (preferably near Chicago) in development or control work. Age 23, single. Excellent references. Box 10-150.

**METALLURGIST OR ASSISTANT SUPERINTENDENT:** Age 35. 12 years' experience in various phases of metallurgy and supervising. Desires position with close proximity to management. Experience in production and research. Can set up laboratory for all metallurgical testing procedures including metallography. Can do investigation and consult with and advise others with regard to metallurgical problems. Available now. Box 10-155.

**METALLURGICAL ENGINEER:** B.S. in metallurgical engineering, University of Pittsburgh, June 1949. Comprehensive training in ferrous metallurgy. Some research on heat treatment of magnetic materials. Some experience. Desires position in production leading to sales work. Location, eastern Pennsylvania, New Jersey, Maryland or Delaware. Box 10-160.

**CHIEF METALLOGRAPHER OR METALLURGIST:** Age 35, available now. Desires position in production or research. Can set up metallurgical laboratory and equipment in all metallurgical testing. Has had a wide background. Will consult and advise on metallurgical problems. Box 10-165.

(More employment on page 54)

## EMPLOYMENT

(Continued from page 53)

### POSITIONS OPEN—East

**JUNIOR METALLURGIST:** For metallurgical laboratory of nonferrous metal producer. Should be trained in mill processes and development work. Some experience desired, but will consider recent graduates. Box 10-170.

**DIE CASTING EXPERT:** Man aged 30 to 50 to fill opening as head of die casting section. Extensive experience in die casting aluminum and zinc required. Should be completely familiar with trouble shooting, able to set up work and equipment, as well as run castings to a hardware finish. Box 10-175.

### POSITIONS WANTED

**METALLURGICAL ENGINEER:** Recent graduate University of Pittsburgh. Special interest in metallography and heat treatment; production methods and sales. Experience as checker and crane operator in rough stock and pickling department, inspector of ordnance material. Available at once. Box 10-180.

**METALLURGIST:** Thirty-two years experience in manufacture of high speed steel cutting tools, such as drills, reamers and end mills. Experience covers supervision of forging, welding, heat treating, inspection, chemical and metallurgical laboratory and all testing. Four years as plant manager in full charge of production. Box 10-185.

**METALLURGICAL ENGINEER:** Wealth of experience (11 years) in research, engineering and production of wrought, cast, and welded ferrous and nonferrous alloys. Will exchange for responsible job as sales engineer, development engineer, or management consultant in east (Philadelphia area preferred) or midwest. Age 33, married, presently studying business administration. Box 10-190.

**METALLURGICAL ENGINEER:** B.Sc. Queen's University (Canada), 1949. Veteran, age 24, single. Some experience in openhearth and electric furnace production. Desires position in production capacity or technical sales. Willing to locate anywhere in U. S. or Canada. Box 10-195.

**YOUNG GRADUATE METALLURGIST:** Age 25, married. Desires position as trainee in any phase of metallurgy including sales. Anxious to start at bottom. Location immaterial. Box 10-200.

**MATERIALS ENGINEER:** M.Sc. Sound knowledge of engineering materials, metallurgy and chemistry. Able to assume difficult production problems through research and development. Broad experience in quality control of end-products by proper selection, processing and use of raw materials. Effective cost reduction programming through these factors and reduction of scrap. Box 10-205.

**METALLURGICAL ENGINEER:** Precision casting processes. B.S. Northwestern University, age 38, married. 14 years development, sales, research, foundry processes; 4½ years plaster mold and investment casting development. Qualified in materials control, fabrication of metals from casting to finished product. Position desired in research, development or production. Progressive and cost conscious. Box 10-210.

**METALLURGICAL ENGINEER:** Married, M.S. in metallurgy from Stevens Institute of Technology, 1948. Thesis in powder metallurgy. Experience in laboratory and production. 12 years in ferrous and nonferrous metals industries. Seven years at research laboratory. Desires position in east. Complete resume of experience on request. Box 10-215.

**POWDER METALLURGIST:** Nine years experience in production. Powder metallurgy fabrication of parts from iron, copper, bronze, brass, steel and magnetic alloys. Excellent background in plant setup, management and operation. Three years research and development. Tool design, press setup, process specification, control and cost analyses. B.S. in metallurgical engineering, married, age 34, locate anywhere. Box 10-220.

netic methods and by study of the reactivity of solids at their transformation temperatures. Various applications in ceramics, glass, cement, refractory materials, and powder metallurgy. 36 ref.

**25A-122. Engineering Research in the Universities.** W. L. Everitt. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 9-12, 98.

**25A-123. Engineering Research at Research Institutes.** Clyde Williams and Bert D. Thomas. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 13-16, 99-101.

History and current activities of the various U. S. research institutes. Trends and future prospects.

**25A-124. Engineering Research in Industry.** Games Slayter. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 17-20. Problems encountered.

**25A-125. Horizons in Metallurgy.** J. B. Austin. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 43-46, 114-117.

Recent developments and future prospects.

**25A-126. Role of the Mineral Industries in the National Economy.** John D. Sullivan and Margaret L. Willigman. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 61-64, 123-131.

Previously abstracted from condensed version in the April issue of *Engineering Experiment Station News*, item 25A-77, 1949.

**25A-127. Role of the Mineral Industries in the National Economy.** John D. Sullivan and Margaret L. Willigman. *Mines Magazine*, v. 39, July 1949, p. 17-22, 24.

Previously abstracted from *Engi-*

## METALLURGICAL ABSTRACTS (GENERAL AND NON-FERROUS)

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## METALS REVIEW

7301 Euclid Ave.

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neering Experiment Station News, item 25A-77, 1949

25A-128. 5974 Foundries in United States and Canada. *Foundry*, v. 77, Aug. 1949, p. 81.

A tabulation by states and type.

25A-129. Sur la détermination du nombre de molécules grasses adsorbées par un métal au cours de la lubrification. (Determination of the Number of Fatty-Acid Molecules Adsorbed by Metals During Lubrication.) Jean-Jacques Trillat and Jean Brignonnet. *Comptes Rendus*, v. 228, May 16, 1949, p. 1587-1588.

Results of investigation showed that the adsorption of oleic acid reaches a maximum of about 500 layers of molecules after continuous contact with a stream of the acid for about 4 hr.

25A-130. How To Identify Engineering Materials. Benjamin Melnitsky. *Steel*, v. 125, Aug. 29, 1949, p. 66-70, 72.

Clear and accurate marking of forgings, castings, and tubing in process. Production economies which can result.

25A-131. The French Nuclear Reactor. *Metal Progress*, v. 56, Aug. 1949, p. 202-203. Translated excerpts from articles by Frederick Joliot-Curie, Maurice Surdin, Bertrand Goldschmidt, and L. Kowarski. *Atomes*, Feb. 1949.

New 10-kw. reactor using bars of sintered uranium oxide immersed in heavy water.

25A-132. Britain's Base Metal Position. P. J. Sergeant. *Mining World*, v. 11, Sept. 1949, p. 39-40.

Analysis of Britain's current position indicates that the future of the Empire's mining industry may be tied to U. S. prices.

25A-133. U. S. Bureau of Mines Reorganizes. James Boyd. *Mining Engineering* (News Section), v. 1, Sept. 1949, p. 40-41.

It is believed that the new system will cut red tape in Bureau aid to industry, will enable it to provide more information for policy-making government agencies, and will be cheaper to operate.

25A-134. Planning of Engineering Research. W. E. Kingston. *Metal Progress*, v. 56, Sept. 1949, p. 341-343.

One method of planning basic and applied research that has made available improved returns from engineering effort, not only in terms of practical and theoretical results, but also from the standpoint of the satisfaction and happiness of engineering staff members.

25A-135. Metallurgy Program of the Office of Naval Research. I. R. Kramer. *Metal Progress*, v. 56, Sept. 1949, p. 351-355.

Fields of research are: plastic flow and fracture; transformation in solid metals; effects of alloying elements; corrosion; new heat resistant materials; and chemistry of steelmaking.

## 25B—Ferrous

25B-40. Alliquippa Works: Jones & Laughlin Steel Corporation. Charles Longenecker. *Blast Furnace and Steel Plant*, v. 37, Aug. 1949, p. 927-980.

Extensive illustrated description of the coke, iron, and steel melting departments, the blooming, billet, bar, and finishing mills, and auxiliaries.

25B-41. Sheet, Strip and Tinplate Industry in Western Europe. Paul Damon. *Iron & Steel Engineer*, v. 26, Aug. 1949, p. 79; discussion, p. 79-81.

An economic survey.

25B-42. Prescribed Lubrication for Iron and Steelmaking Equipment. A. F. Brewer. *Steel*, v. 125, Sept. 12, 1949, p. 106-109, 146.

Lubrication of machinery prior to rolling. Load and dirt problems, openhearth lubrication, requirements of lubricants, and trend toward centralized lubrication.

25B-43. Steel Products Manual. Sec. 16. Carbon Steel Wire. Sec. 28. Alloy Steel Wire. *American Iron and Steel Institute*, 1949, 174 and 83 pages.

Metallurgical aspects, manufacturing practices, chemical requirements, and packaging, marking, and loading methods. Commodity descriptions.

## 25C—Nonferrous

25C-49. Leading Producers of Copper in 1948. David N. Skillings. *Skillings Mining Review*, v. 38, July 23, 1949, p. 1, 4, 13.

Data for 25 leading companies and brief summaries of activities for 15 of them.

25C-50. The Bureau of Aeronautic's Titanium Program. N. E. Promisel. Office of Naval Research, "Titanium; Report of Symposium on 'Titanium'". Mar. 1949, p. 5-11; discussion p. 11. See abstracts from *Metal Progress*, items 3C-58 and 25D-6, 1949.

25C-51. The Program of the Air Materiel Command on Titanium Alloys. Richard R. Kennedy. Office of Naval Research, "Titanium; Report of Symposium on 'Titanium'". Mar. 1949, p. 12. See listing from *Metal Progress*, item 25D-8, 1949.

25C-52. The Titanium Program of Army Ordnance. Laurence S. Foster. Office of Naval Research, "Titanium; Report of Symposium on 'Titanium'". Mar. 1949, p. 18-19; discussion p. 19. Previously listed from *Metal Progress*, item 25D-7, 1949.

25C-53. The Titanium-Base Alloys Program of the Naval Research Laboratory. E. J. Chapin. Office of Naval Research, "Titanium; Report of Symposium on 'Titanium'". Mar. 1949, p. 144-150; discussion p. 150-151. See abstract from *Metal Progress*, item 25D-9, 1949.

25C-54. Titanium Alloys for Aircraft. Nathaniel F. Slisbee. *Aero Digest*, v. 59, Aug. 1949, p. 38-39, 106, 108, 110. Recent research and potentialities.

25C-55. (Book) Tin; Its Mining, Production, Technology, and Applications. Ed. 2. C. L. Mantell. 573 pages. 1949. Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y.

New practices and procedures in connection with ores and ore deposits, mining and ore dressing, smelting and metallurgy, tin conservation, electrolytic tin plate, binary alloys, ternary and quaternary systems, hot-dip coatings, tin cans, foil and collapsible tubes, corrosion, and analytical methods. Special consideration to the use of secondary tin.

25C-56. (Book) Titanium; Report of Symposium on Titanium. 157 pages. Mar. 1949. Office of Naval Research, Washington 25, D. C.

Welcoming address, introduction, and 17 papers and accompanying discussion presented at meeting held Dec. 16, 1948. Individual papers are separately abstracted.

25C-57. Metallurgical Laboratory at Oak Ridge. L. K. Jetter and E. E. Stansbury. *Metal Progress*, v. 56, Aug. 1949, p. 187-193.

Newly completed laboratory designed for metallurgical studies of the heavy elements, the trans-uranium metals, and materials for reactors and power piles. Unusual precautions against radioactive and toxic hazards are provided, even though the level of radioactivity is rather low in this section.

25C-58. Titanium—Metal of the Future. Oliver C. Ralston. *Metals*, v. 20, Aug. 1949, p. 11-12.

Present status and widespread research and development.

25C-59. Tantalum. G. L. Miller. *Industrial Chemist and Chemical Manufacturer*, v. 25, Aug. 1949, p. 388-390.

Historical aspects of the element and its metallurgy, treatment of ores, production of the metal, properties, and applications of tantalum and its alloys.

## 25D—Light Metals

25D-26. Some Notes on Aluminum and Its Alloys. F. A. Fox. *Machinery Lloyd* (Overseas Edition), v. 21, July 16, 1949, p. 28-30.

Properties, methods of production, and applications.

25D-27. The Bureau of Aeronautics' Magnesium Program. J. E. Sullivan. *Magazine of Magnesium*, Aug. 1949, p. 8-11.

Research program.

25D-28. The Light Metal Picture. Francis C. Frary. *Metal Progress*, v. 56, Aug. 1949, p. 204-208.

Distribution of aluminum capacity in the U.S. and recent trends in world production.

25D-29. Light Metals Economic Outlook. *Modern Metals*, v. 5, Aug. 1949, p. 17.

25D-30. Light Metals: Methods of Production; Present Applications; Future Prospects. H. Sutton. *Metal Industry*, v. 75, Aug. 26, 1949, p. 163-166. A survey.

25D-31. Trends in High-Strength Wrought Aluminum Alloys. W. B. F. Mackay. *Metal Progress*, v. 56, Sept. 1949, p. 331-336, 404, 406.

Development and future possibilities. Believes that a commercial Cu-Mg-Zn-Al alloy having an ultimate tensile strength of 100,000 psi. will be eventually marketed. Production of a stronger alloy is more problematical. 23 ref.

## ADVERTISERS INDEX

Alox Corp. ....	29
Armour Ammonia Division, Armour and Co. ....	43
Burrell Technical Supply Co. ....	33
Electric Furnace Co. ....	41
Holden Co., A. F. ....	.....Front and Back Cover
Institute of Metals ....	54
Ryerson & Son, Inc., Jos. T. ....	17

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